Geol Survey

Guide to the geology of the Woodstock area, McHenry County

David L. Reinertsen
John M. Masters

Field Trip Guidebook 1989C October 14, 1989
Department of Energy and Natural Resources
ILLINOIS STATE GEOLOGICAL SURVEY
Champaign, IL 61820

Cover photo: Geological Science Field Trip participants at a sand and gravel pit in northeastern Illinois.

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SYSTEM OR SERIES	Hydrogeologic units and thickness	Graphic log	Rock type	Water-yielding characteristics
PLEISTOCENE	Drift (0 400')		Unconsolidated glacial deposits, loess and alluvium	Water yields variable, largest from thick outwash deposits in western part of county
SILURIAN	Niagaran–Alexandrian (0 – 100')		Dolomite, very pure to very silty; cherty; shale partings toward base	Yields moderate to large supplies where creviced and overlain by permeable sand and gravel. Productivity lessens with thinning of dolomite and thickening of shale
ORDOVICIAN	Maquoketa (0 - 200')		Shale, green and blue with limestone and dolomite beds	Yields small to moderate supplies from dolomite and fractured shale
	Galena–Platteville (0 - 300')		Dolomite, with shale in middle, limestone and chert in lower part	Yields moderate to large supplies only in areas where not overlain by Maquoketa, as near Union and Marengo
	Glenwood–St. Peter (200 - 350')		Sandstone, fine- to coarse-grained; shale at top; locally cherty, red shale at base	Yields small to moderate quantities of water
	Prairie du Chien (100'±)		Dolomite, sandy, cherty; interbedded with sandstone	Yields small amounts of water from sandstone and crevices in dolomite
CAMBRIAN	Eminence–Potosi Franconia (200'±)		Dolomite, white, fine-grained Sandstone, fine- to medium-grained	Yields small amounts of water from crevices in dolomite and sandstone
	Ironton–Galesville (100 - 300')		Sandstone, fine- to medium-grained, well sorted	Most productive aquifer in Cambrian-Ordovician Systems; can yield large supplies of water
	Eau Claire (200 - 450')		Shale and siltstone, dolomitic	Shales generally not water-yielding; acts as confining layer at base of Cambrian-Ordovician aquifer system
	Mt. Simon (275' in NW to 950' in SE)		Sandstone, coarse grained, lenses of shale and siltstone	Yields moderate amounts of water; water quality generally good within McHenry County, but deteriorates with depth
PRECAMBRIAN			Granite, red	Not water-yielding

Figure 1 Generalized column of rock formations in McHenry County (Hackett and McComas, 1969).

GEOLOGY OF THE WOODSTOCK AREA, MCHENRY COUNTY

The Woodstock field trip area in northeastern Illinois is located 4 to 17 miles south of the Illinois-Wisconsin state line and about 50 miles northwest of downtown Chicago. During the years following World War II, few of the communities and industries in McHenry County grew as rapidly as did the communities and industries closer to Chicago. Towns, cities, and counties east of the Fox River and located along railroads and major highways became "bedroom communities," ideal residential areas within easy commuting distance of Chicago. Several towns in the eastern part of McHenry County that also fell into this suburban category nearly doubled their population from the late 1940s to late 1960s.

McHenry County planners were aware during the early 1950s that they would eventually be faced with the same environmental problems the bedroom communities had already confronted, in some cases none too easily. Although the suburban communities had resolved some land-use problems, the interrelationships between mineral resources, urban sprawl, and waste disposal were not understood. Recognizing that uncontrolled development and population growth would severely stress the natural and economic assets of their county, the McHenry Regional Planning Commission turned to the Illinois State Geological Survey for assistance in developing a plan for the future. Basic studies of the physical environment coupled to an inventory of natural resources would form the factual base for county planning.

Survey scientists, Hackett and McComas, published the results of their work, *Geology for Planning in McHenry County*, in 1969. Collection and interpretation of geologic data, according to Hackett and McComas, included

1. mapping the thickness and distribution of surface and subsurface geologic units, including soils; sampling and laboratory testing of earth materials; describing and differentiating geologic units on the basis of their composition and physical properties;

2. evaluating geologic units in terms of their mineral-resource potential, engineering properties, and hydrology (properties, distribution, and circulation of water);

3. preparing interpretive maps showing which areas are rated for specific land uses;

4. analyzing and differentiating land units on the basis of geologic factors such as landforms and their relationships to sequences of underlying earth materials.

Data developed during this study were designed to give the county a broad planning picture, which could also be applied on a regional scale. Hackett and McComas, as well as the county planners, recognized that local or specific site plans would need greater detail to properly address land use and resource development. Surface data would need to be collected around the site, and a drilling program set up to obtain needed subsurface data. McHenry County planners and citizens have taken an environmentally conscious approach to development. Although home and some apartment/condominium construction is continuing, it has been at a conservative scale and rate, unlike that noted in counties to the east and southeast. Also, you will note that the countyside is very clean along the field trip route.

Bedrock

Through hundreds of million years, the McHenry County area underwent many changes. The ancient Precambrian basement that comprises granitic igneous, and possibly metamorphic, crystalline rocks lies deeply buried beneath younger sedimentary strata about 2,700 feet thick to the northwest and about 3,200 feet thick to the southeast. Deposited in shallow seas that repeatedly covered this part of our continent during the Paleozoic Era, these sedimentary rocks range from about 523 million years old, the Cambrian Period, to nearly 408 million years old, the Silurian Period (fig. 1).

Silurian dolomite occurs in patches beneath the glacial cover in the field trip area. It crops out in the southwestern part of McHenry County near Garden Prairie where it was formerly quarried for crushed stone. Fossiliferous strata of the Maquoketa Shale Group of Ordovician age are exposed under the Silurian dolomite in the quarry and at the bedrock surface beneath the glacial drift where the overlying Silurian dolomite is absent. Younger Paleozoic sedimentary rocks, known from outcrops 60 to 70 miles to the south and from subsurface data near Des Plaines about 30 miles to the southeast, may well have been deposited across this region. However, during the nearly 245 million years between the close of the Paleozoic Era and the onslaught of the Pleistocene glaciers 1 to 2 million years ago, ample time had passed to erode perhaps thousands of feet of rock strata from the region and remove all traces of their presence. Indirect evidence based on the rank of coal deposits and the generation of petroleum from source rocks in the Illinois Basin indicates that no more than about 1 mile of latest Paleozoic and younger rocks was ever deposited in northern Illinois.

Structure

Bedrock strata in this area dip very gently to the southeast away from the Wisconsin Arch onto the Kankakee Arch, a broad structural arch that trends northwest to southeast and connects the Wisconsin and Cincinnati Arches (fig. 2). The Kankakee Arch separates two broad structural basins--the Illinois Basin (fig. 3) to the southwest and the Michigan Basin to the northeast. The rocks slope a few feet per mile, dipping considerably less than 1°. This dip would be imperceptible to the naked eye unless there were a very long, open outcrop. Nearby in northern Illinois, local exposures show rocks that have been folded and/or faulted into steeper attitudes. Because tilting of the bedrock layers took place several times during the Paleozoic Era, the dips of successive strata are not parallel to one another.

Glacial History

A brief general history of glaciation in North America and a description of the deposits commonly left by glaciers may be found in the section, *Pleistocene Glaciations in Illinois* (at the back of this guide leaflet).

In the field trip area, erosion that took place long before glaciers advanced across Illinois left a network of deep valleys carved into the bedrock surface. The drainage divide between what is now Lake Michigan (Atlantic Ocean) and the Mississippi River (Gulf of Mexico) extended in a southwesterly direction from east of Harvard to east of Garden Prairie where it turned southeastward toward the Elgin area. A bedrock valley trends east-northeast from south of Marengo, where it is buried by 100 to 170 feet of glacial drift, toward Fox Lake where the drift is about 200 feet thick. Partly because of the irregular bedrock surface and partly because of erosion, the glacial drift is unevenly distributed in McHenry County. In some places, it is more than 400 feet thick.

Beginning about 1.6 million years ago during the Pleistocene Epoch, continental glaciers--massive sheets of ice thousands of feet thick--flowed slowly southward from Canada. The last of these glaciers melted from northeastern Illinois about 13,500 years before the present (B.P.). Although ice sheets covered Illinois several times during the Pleistocene Epoch, not until the Illinoian glaciation around 270,000 years B.P. did North American continental glaciers reach their southernmost extent. They advanced from centers of snow and ice accumulation in Canada as far south as the northern part of Johnson County in southern

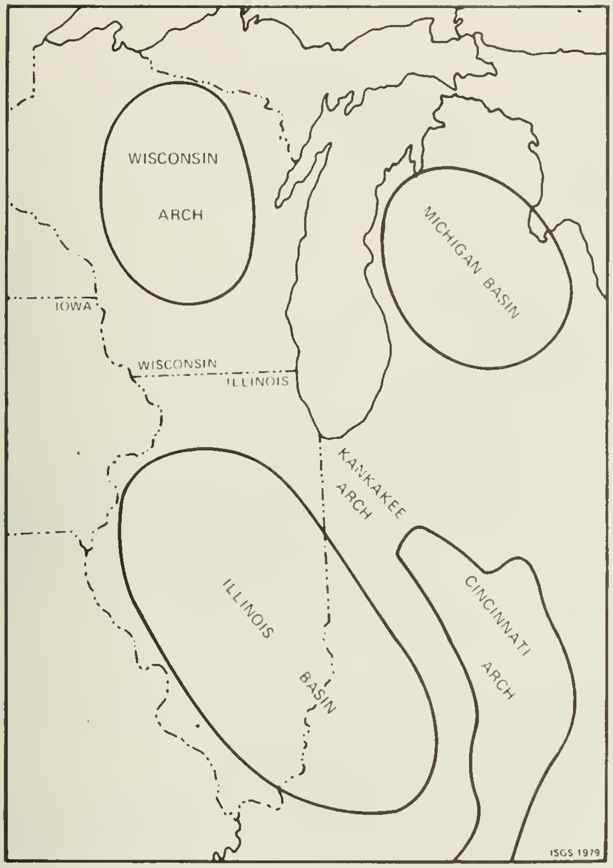


Figure 2 Location of the Kankakeee Arch and adjacent structures, Wisconsin Arch, Cincinnati Arch, Illinois Basin, and Michigan Basin in the north-central Midcontinent Region (from Reinertsen, 1979).

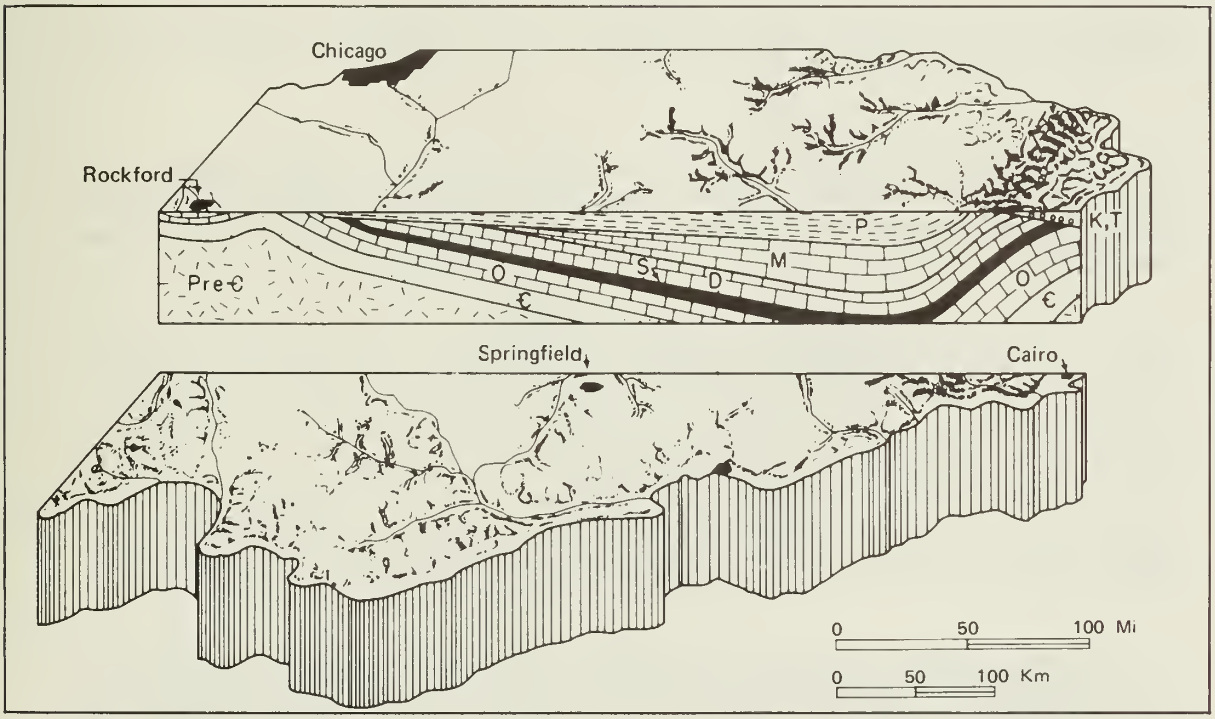


Figure 3 Stylized north-south cross section shows structure of the Illinois Basin. The thickness of sedimentary rocks has been greatly exaggerated and younger, unconsolidated surface deposits have been eliminated. The oldest rocks are Precambrian (Pre-C) granites. They form a depression filled with layers of sedimentary rocks of various ages: Cambrian (C), Ordovician (O), Silurian (S), Devonian (D), Mississippian (M), Pennsylvanian (P), Cretaceous (K), and Tertiary (T). Scale is approximate.

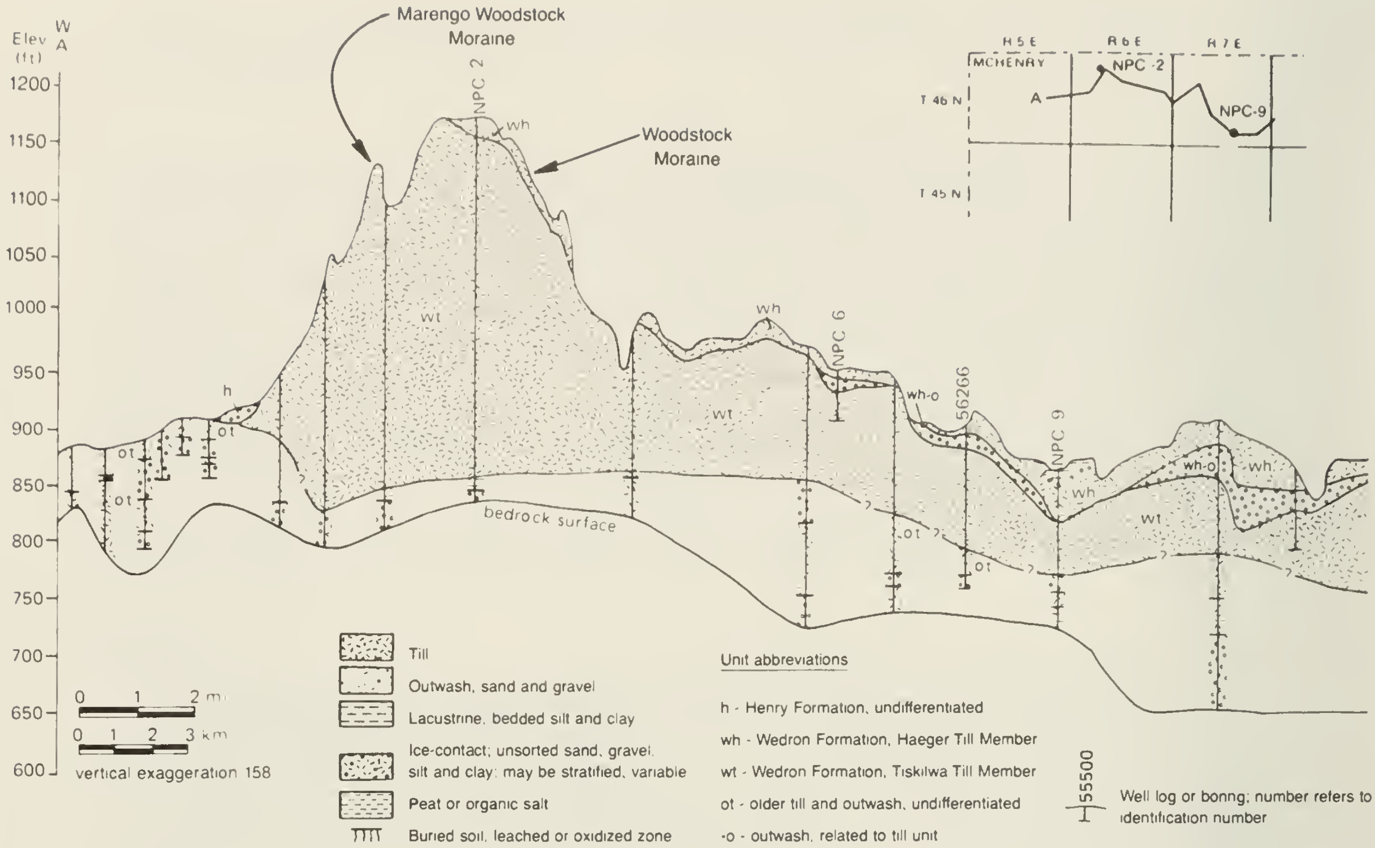


Figure 4 Northwestern McHenry County cross section shows the relationship of the Marengo and Woodstock Moraines (adapted from Wickham, 1988).

Illinois. Illinoian glaciers probably built morainic ridges similar to those of the later Wisconsinan glaciers, but Illinoian moraines were apparently not so numerous. Also they were exposed to weathering and erosion for thousands of years longer than their younger Wisconsinan counterparts.

The Lake Michigan Lobe, part of the Wisconsinan continental ice-sheet, flowed southward through the Lake Michigan Basin before spreading westward and southwestward across Illinois. Irregularities in the bedrock and the surface topography at least partly controlled successive ice advances. The western edge of the Lake Michigan Lobe is the Marengo Moraine, a massive ridge that extends southward from the Wisconsin border for about 40 miles. After this moraine formed, the ice front melted eastward an unknown distance before readvancing part of the way across the area to form another moraine, the Gilberts. This process was repeated several times, forming successive eastward moraines such as the Barlina and Woodstock, and producing a layered, shingle effect to the deposits (fig. 4).

In many places where the Wisconsinan glaciers scraped across the land, erosion of the earlier glacial deposits was so extensive that only scattered patches of the Illinoian and older drifts remain beneath the younger Wisconsinan drifts. Recent work by ISGS field geologists (Berg, Kempton, Follmer, and McKenna, 1985; Curry and Krumm, 1986; Curry and Follmer, 1988; Curry, 1988) strongly suggests that glacial deposits in Kane County once thought to be early Wisconsinan are actually Illinoian in age. Furthermore, no early Wisconsinan glacial drift appears to be present anywhere in Illinois.

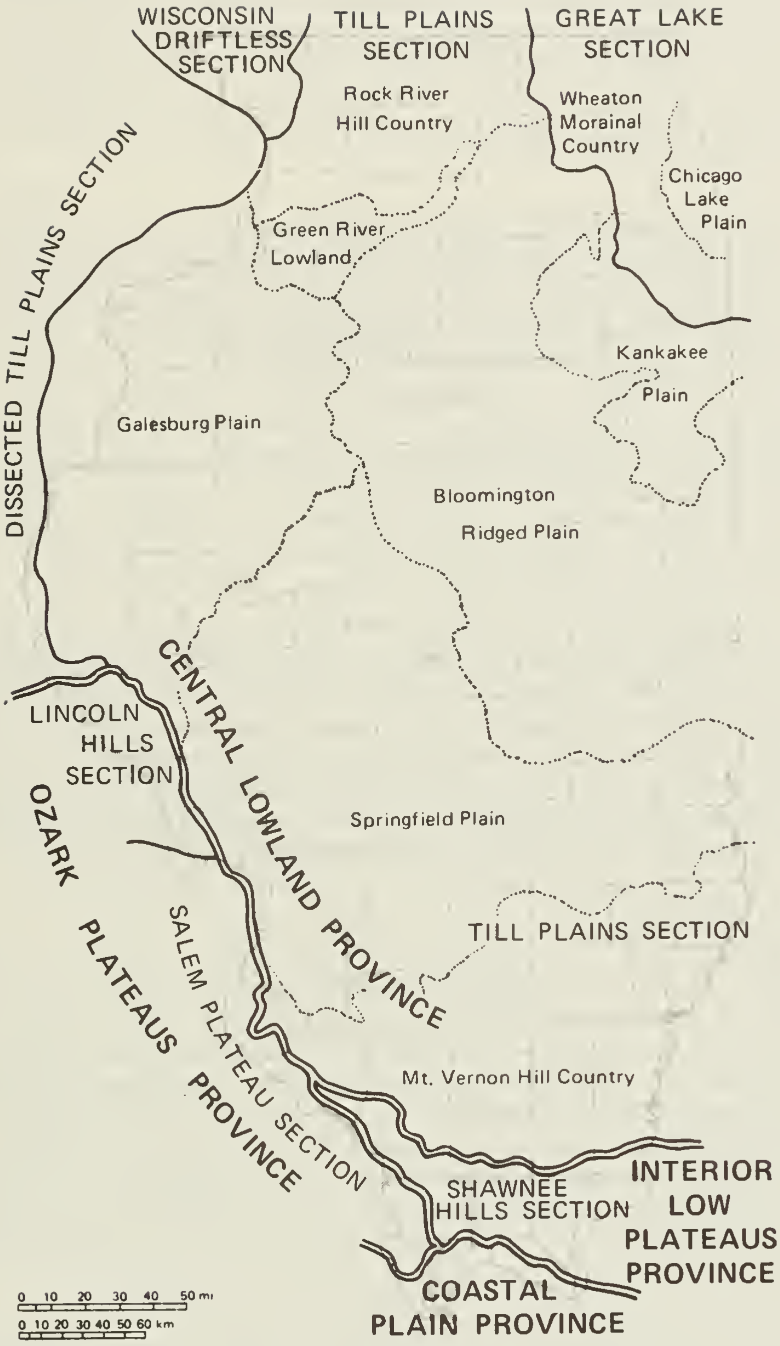


Figure 5 Physiographic divisions of Illinois.

Physiography

The landscape of northeastern Illinois is dominated by the landforms deposited by the Wisconsinan continental glaciers that flowed west and southwestward out of the Lake Michigan Basin between 25,000 and about 13,500 years ago. The Woodstock field trip area is situated largely in the Wheaton Morainal Country of the Great Lake Section, Central Lowland Province (fig. 5). The Wheaton Morainal Country is distinguished from the Till Plains Section of the Central Lowland Province to the west and south by the many pronounced, roughly parallel, concentric, discontinuous, morainal ridges surrounding the Lake Michigan

Basin. Elongated hills, mounds, basins, sags, and valleys formed from thick glacial deposits further complicate the details of the region's topography. Various ice-contact and meltwater features such as kames, kame terraces, kettles, basins, and eskers--while not abundant--occur more frequently here than elsewhere in Illinois. Also, the lakes, marshes, and bogs characteristic of the hummocky topography formed by melting glaciers are common. The Wisconsinan glacial drift deposits, generally at least 100 feet thick, completely bury the underlying bedrock surface.

Near the end of the field trip, the route crosses westward for a short distance into the Rock River Hill Country of the Till Plains Section (fig. 5). These subdued, rolling hills in the erosional stage of late youth to early maturity developed on the thin Illinoian till that lies west of the Marengo morainal ridge. In this section, the positions of the major uplands and valleys are determined primarily by the topography of the bedrock surface.

Drainage

Drainage in the eastern part of the field trip area is through Nippersink and Boone Creeks and their tributaries to the Fox River. To the west the area is drained by Piscasaw, Mokeler, and Rush Creeks and their tributaries to the Kishwaukee River, which flows west to the Rock River.

Relief

The topography of McHenry County is probably the most rugged of any of the glaciated counties in Illinois. The highest land surface in the Woodstock field trip area is slightly more than 1,080 feet above mean sea level (msl) southwest of US 14 approximately 2 miles southeast of the US 14 and IL 23 junction. The lowest elevation is about 797 feet msl where the route first crosses Boone Creek east of Woodstock. The regional relief, calculated as the difference in elevation between the highest and lowest surfaces, is about 285 feet. Local relief is most pronounced along Boone Creek where it is nearly 135 feet.

MINERAL PRODUCTION

Of the 102 counties in Illinois, 99 reported mineral production during 1987, the last year for which complete records are available. (Stone production is reported for the odd-numbered years, and sand and gravel production is reported for the even-numbered years.) Estimates for 1987 sand and gravel production are included in the total value given for mineral production. The total value of all minerals extracted, processed, and manufactured in Illinois during 1987 was $3,226,200,000, a decline of nearly $42 million from the previous year and the lowest recorded total value since 1978. In Illinois, coal continued to be the leading commodity, followed by oil, stone, sand and gravel, and clays. Illinois dropped from sixteenth to seventeenth among the 50 states in total production of nonfuel minerals but continued to lead all other states in production of fluorspar, industrial sand, and tripoli.

Sand and gravel production for Illinois during 1987 is an estimated 28.3 million tons, an increase of 1.6 percent from 1986. Its value is expected to reach $93.3 million or an average of $3.30 per ton, up 11.5 percent from 1986. Because of the relatively low unit price of construction sand and gravel, shipping most construction aggregate more than about 50 miles from the pit is not economical.

McHenry County ranked 28th among Illinois counties in the value of its mineral production, although sand and gravel was the only mineral commodity produced here during 1987. Construction sand and gravel sources are found mainly in glacial deposits, chiefly valley trains and outwash plains. For reporting purposes, the state has been divided into four districts, which allows consolidating data and protects the confidentiality of individual producers. District 1 in northern Illinois comprises 18 counties, including McHenry, Kane, Lake, and Du Page, which accounted for more than 54 percent of the state's total production during 1986. McHenry County ranked first in sand and gravel production among the 18 counties in District 1.

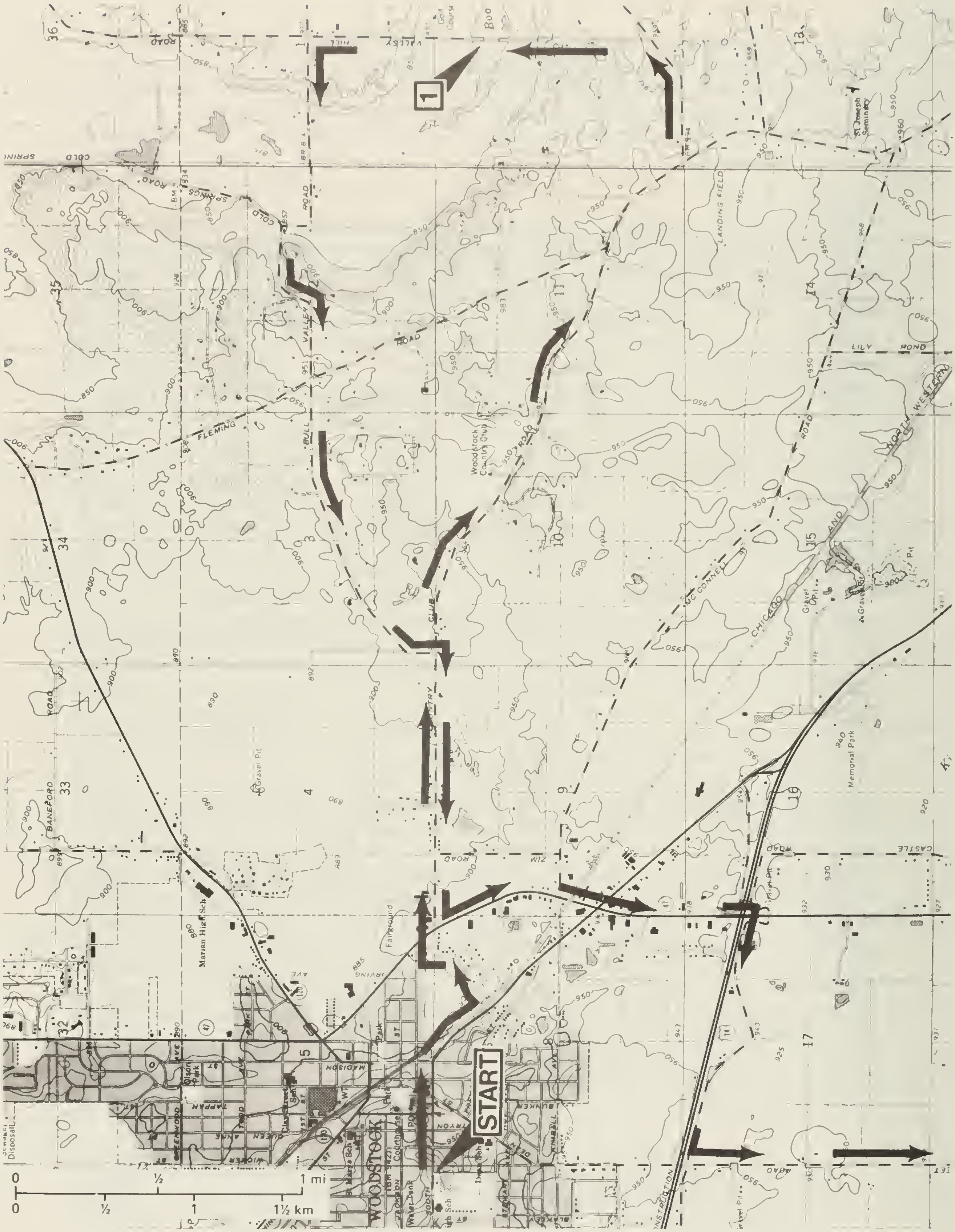
GROUNDWATER

Groundwater is a mineral resource frequently overlooked in assessment of an area's natural resource potential. The availability of this mineral resource is essential for orderly economic and community development. More than 48 percent of the state's 11 million citizens depend on groundwater for their water supply. Groundwater is derived from underground formations called *aquifers*. An aquifer is a body of rock that contains enough water-bearing porous and permeable materials to release usable quantities of water into an open well or spring. The water-yielding capacity of an aquifer can only be evaluated by constructing wells into it. After construction, the wells are pumped to determine the quality and quantity of groundwater available for use.

Aquifers occur down to depths as great as 2,000 feet below McHenry County and supply the water for municipal, irrigation, domestic, and livestock purposes. Aquifers beneath the county fall into three major groups: (1) glacial drift aquifers, (2) shallow bedrock aquifers, occurring at depths less than 300 feet below the surface, and (3) deep sandstone aquifers, generally more than 500 feet deep.

Although sand and gravel aquifers in the glacial outwash deposits are widespread throughout the county, they are not evenly distributed. These aquifers are relatively thick, highly permeable, and extensive along the major drainage ways where they are used as sources of water for irrigation, municipal, and industrial needs as well as for domestic and livestock supplies. The water-yielding potential of the underlying shallow Ordovician dolomite bedrock is affected by its thickness and by the extent of its fracturing. Wells are drilled to any one or to all three of the deep sandstone aquifers: the Ordovician Glenwood-St. Peter, and the Cambrian Ironton-Galesville (most productive) and Mt. Simon.

Data on available groundwater sources in the county indicate that not only are the surficial sand and gravel deposits the most productive and accessible of the various systems, but they also have a high natural recharge rate because they extend to the land surface in many areas. These shallow sand and gravel aquifers also have a high potential for artificial recharging. Groundwater aquifers, especially those exposed near the surface or overlain by very thin cover, are susceptible to pollution from agricultural and urban land use and waste-disposal activities. Increased irrigation from shallow aquifers in areas of thick surficial sands and gravels in combination with heavy fertilizer applications can lead to degradation of these aquifers. As Hackett and McComas (1969) noted, "the development pattern of the region with the associated elements of land drainage, storm-water drainage, septic-system disposal, land-fill waste disposal, etc., can be a significant factor in the deterioration of the prime groundwater resource areas. If development is allowed to proceed without consideration of the measures required for protection, progressive deterioration and eventual loss of the resources will result."


START
1
WOODSTOCK
Woodstock Country Club
Marian High Sch
Fairground
Memorial Park
St Joseph Seminary
Gravel Pit
COLD SPRINGS ROAD
BULL VALLEY ROAD
FLEMING ROAD
COUNTRY CLUB ROAD
LANDING FIELD ROAD
LILY POND
CHICAGO AND NORTH WESTERN
MC CONNELL
BANEFORD ROAD
CASTLE ROAD
MADISON
TAPPAN
QUEEN ANNE
IRVING AVE
Sewage Disposal
Courthouse
Water Tank
0 ½ 1 mi
0 ½ 1 1½ km

GUIDE TO THE ROUTE

Miles next point	Miles/ starting point	
0.0	0.0	Line up heading north on Putnam Street on the east side of Woodstock High School (NE NE NE sec. 7, T44N, R7E, 3rd P.M., McHenry County, Woodstock 7.5-minute Quadrangle [42088C4*]). Mileage calculations begin at the intersection of Putnam and South Streets. TURN RIGHT (east) on South Street.
0.2+	0.2+	STOP: 3-way at Throop Street. CONTINUE AHEAD (east).
0.05+	0.3	STOP: 4-way at Dean Street. CONTINUE AHEAD (east).
0.1+	0.4+	STOP: 4-way at Lake Avenue. CONTINUE AHEAD (east) toward Chicago and North Western Railroad (C&NW) overpass.
0.05+	0.45+	CAUTION: narrow, low railroad overpass with 3-way stop beyond.
0.05-	0.5+	STOP: 3-way at South Seminary Avenue. TURN RIGHT (southeast).
0.25	0.75+	T-intersection. TURN LEFT (east) on Brown Street.
0.25-	1.0	STOP: 2-way at Washburn Street. TURN LEFT (north).
0.05+	1.05+	TURN RIGHT (east) on South Street.
0.1-	1.15+	CAUTION: stoplight at Eastwood Drive (IL 47). CONTINUE AHEAD (east) on South Street (Country Club Road). You are crossing the outwash plain in front of the Cary Moraine.
0.4-	1.55+	The area to the right is a marsh underlain by Grayslake Peat. Aquatic plant remains from sedges and cattails similar to those seen behind the houses have accumulated in and around the marsh for several thousand years to produce the peat deposit.
0.35+	1.9+	The route ascends a series of small hills. This is a kame complex--many kames that have formed together (coalesced), producing a distinct type of topography along the front of the Cary Moraine. The route follows Country Club Road for some distance through an area of kettles (sags) that formed between the knobs or kames. The kettles are the sites of

* The number in brackets following the topographic map name, [42088C4], is the code assigned to that map as part of the National Mapping Program. The state is divided into 1° blocks of latitude and longitude. The first pair of numbers refers to the latitude of the southeast corner of the block and the next three numbers designate the longitude. The blocks are divided into 64 7.5-minute quadrangles; the letter refers to the east-west row from the bottom, and the last digit refers to the north-south column from the right.

detached blocks of glacial ice as the glacier melted. Sediment flushed out of the main ice mass was deposited around the detached ice blocks, perhaps completely covering them. As the ice slowly melted, the sands and gravels surrounding the blocks were let down to the bottom as the sides sagged and slumped into the lower areas. "Knob and kettle" topography produces a sharply rolling, distinctive landscape. Some of the kettles are dry while others containing water are marshes or bogs.

1.75+	3.7	To the LEFT, as the route crosses from the kame complex onto the Cary end moraine, is a large, irregular kettle.
0.35+	4.05+	CAUTION: Fleming Road intersects from the left. Continue ahead (southeasterly) on Country Club Road.
0.3+	4.4	Prepare to turn LEFT on Mason Hill Road.
0.15	4.55	TURN LEFT (east) on Mason Hill Road.
0.4	4.95	Prepare to turn LEFT.
0.1+	5.05+	TURN LEFT (north) on Valley Hill Road at T-intersection.
0.3+	5.4+	CAUTION: descend steep hill into Boone Creek Valley.
0.25	5.65+	Cross Boone Creek culverts and prepare to stop.
0.05+	5.7+	PARK on right shoulder of the road. CAUTION: DO NOT get stuck in ditch.

STOP 1. View and discuss Boone Creek Valley (SW SW NW NE sec. 12, T44N, R7E, 3rd P.M., McHenry County, McHenry 7.5-minute Quadrangle [42088C3]).

The Fox River, which flows south through the eastern part of McHenry County, did not exist before Wisconsinan glaciation. As noted earlier, the bedrock surface in this part of Illinois shows a well-developed drainage network that has no relation to the present drainage pattern. As the glaciers advanced repeatedly across an area, they destroyed many of the earlier stream systems, partly by filling the valleys with drift. Rapid melting of these massive glaciers frequently gave rise to meltwater torrents that eroded new channels and valley systems in front of the ice sheets. The Fox River changed its valley several times because of the advances and melting back of the Woodfordian glaciers.

The valley here appears to have been the ancestral Fox Valley. When the ice sheet that produced the Marseilles Moraine (fig. 6) melted back eastward toward the present river site, meltwater seeking to escape southward downslope in front of the glacier eroded this ancestral valley. Other channels were produced during later ice readvances when parts of the ancestral valley were temporarily blocked by the glaciers. The glacier that formed the Woodstock and Cary Moraines covered this area and at least partially filled the old valley. As the ice melted, part of the ancestral valley was reexcavated. When the ice melted back east of the present valley, a large lake was present north and east behind a morainal dam near the town of Cary. When the meltwater in the lake topped the moraine there, it quickly cut slightly southward into part of the older Fox Valley and drained the lake.

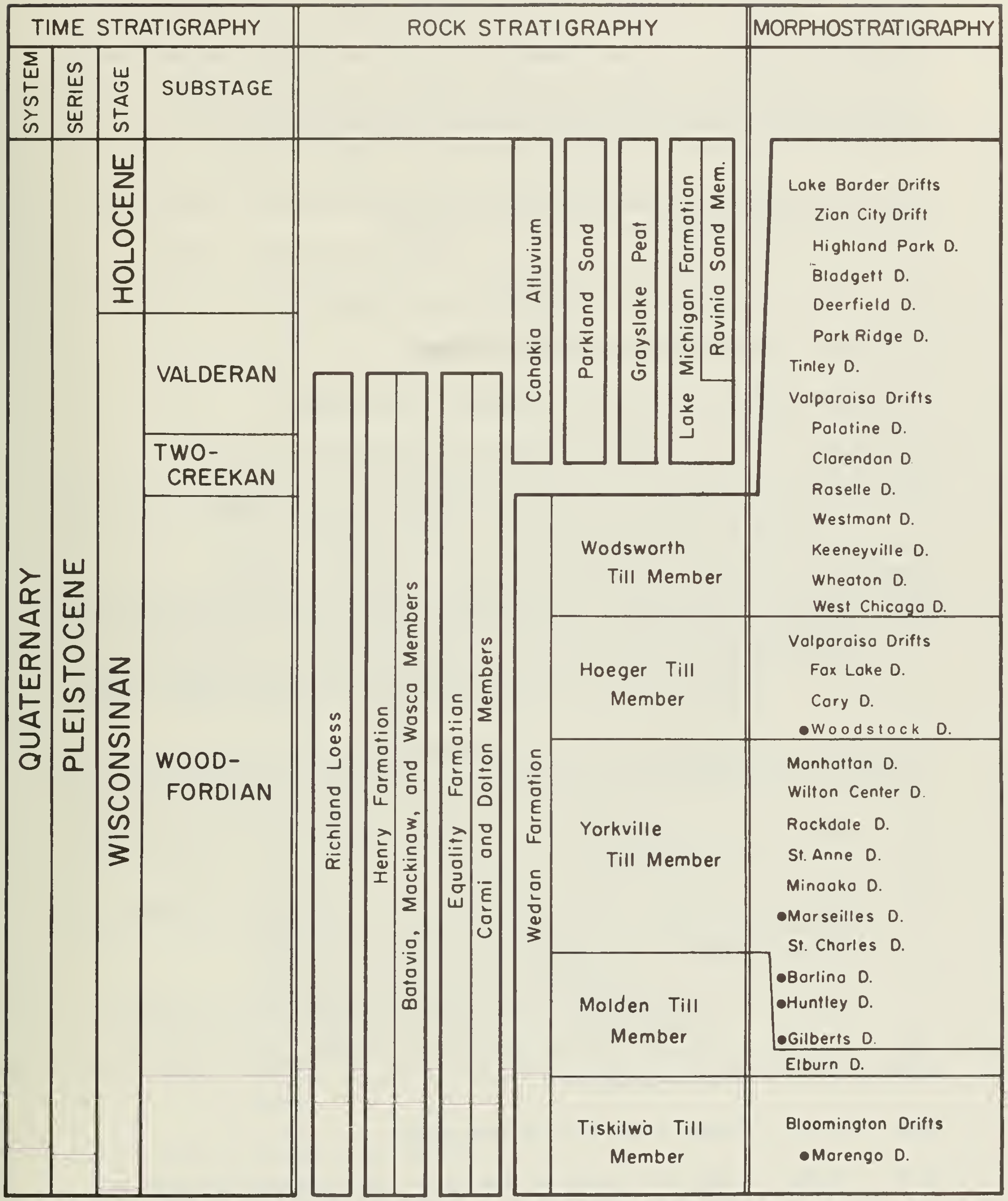


Figure 6 Classification of the Pleistocene rocks of northeastern Illinois (adapted from Willman and Frye, 1970). [• moraines discussed in text.]

The lake mentioned above extended southward into this valley to about 3 miles north of here where a natural dam of glacial deposits controlled the lake level, which was about 25 feet higher than the manmade lake. Drainage from this glacial lake was southward through this area. The lake did not stand long enough to remove all of the natural dam. The present lake, Wonder Lake, has a manmade dam at its northern end, and at its southern end, and a natural, drift dam about 30 feet higher than the north spillway and our location here. Boone Creek is an *underfit stream*--a stream too small to have eroded the valley in which it flows.

Reeds, sedges, and cattails growing along the valley bottom here are the types of plants that have produced the peat resources in northern Illinois.

0.0	5.7+	Leave Stop 1. CONTINUE AHEAD (north).
0.2	5.9	Enter village of Bull Valley.
0.05+	5.95+	Ascend steep north valley wall of Boone Creek.
0.5	6.45	STOP: 4-way at Bull Valley Road. TURN LEFT (west).
0.1	6.55	Begin descent of steep east valley wall of Boone Creek.
0.25+	6.8+	CAUTION: the bridge crossing Boone Creek is narrow.
0.45+	7.3+	STOP: 3-way at "Y" intersection. TURN LEFT (west) on Bull Valley Road and ascend west valley wall of Boone Creek.
0.65+	7.9+	STOP: 4-way at Fleming Road. CONTINUE AHEAD (westerly) on Bull Valley Road across the kame complex.
1.3+	9.3+	STOP: 2-way at Country Club Road. TURN RIGHT (west) toward Woodstock.
0.25	9.55+	We are coming down off of the kame complex onto the outwash plain of the Cary Moraine.
0.85	10.4+	CAUTION: stoplight at Eastwood Drive (IL 47). TURN LEFT (southerly).
0.55+	10.95+	C&NW railroad overpass.
0.1+	11.05+	CAUTION: stoplight at Lake Avenue. CONTINUE AHEAD (southerly).
0.55+	11.65+	CAUTION: stoplight at US 14. TURN RIGHT (westerly) on the 4-lane divided highway.
0.85	12.5+	Prepare to turn LEFT at Dean Street.
0.15	12.65+	TURN LEFT (south) on Dean Street. USE EXTREME CAUTION: fast approaching traffic. For the next 0.3 mile, the route crosses a narrow segment of the Woodstock Moraine, the northwestern limb of what was formerly considered to be the West Chicago Moraine in this area.
0.35+	13.0+	The route rises up onto the backslope of the Barlina Moraine.

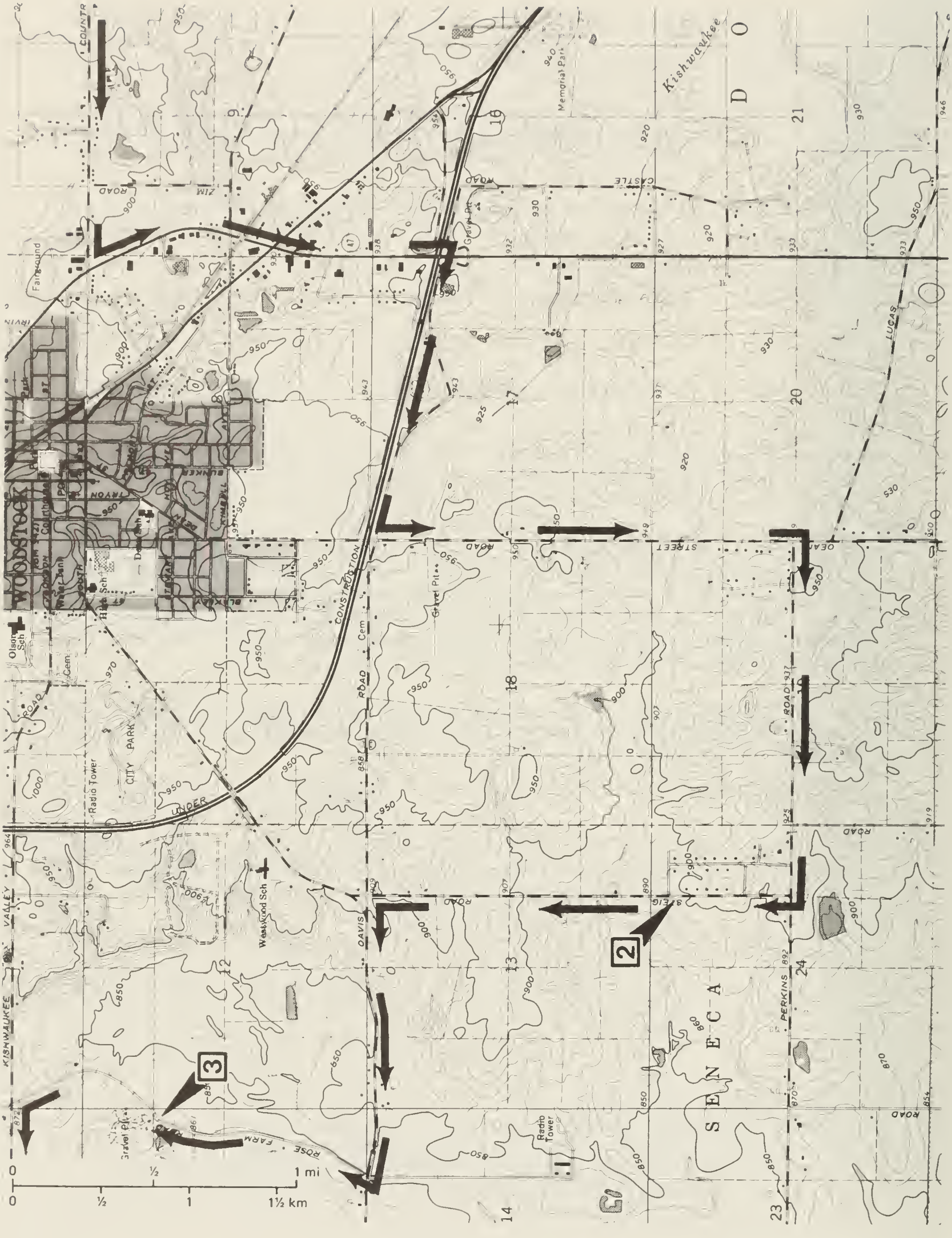
1.0	14.0+	Prepare to turn RIGHT.
0.15+	14.15+	TURN RIGHT (west) on Perkins Road.
0.2	14.35+	Higher elevations of the Barlina Moraine lie to the left (south). When crops are removed from these high areas, one can see that a lot of the topsoil has been eroded away, exposing the underlying stony glacial till.
0.8	15.15+	T-road intersects from the left. CONTINUE AHEAD (west).
0.1	15.25+	Prepare to turn RIGHT.
0.15	15.4+	TURN RIGHT (north) on Steig Road.
0.05+	15.5	The roadcut on the right has an exposure of the Yorkville Till Member.
0.1+	15.6+	PARK along right shoulder of the road. Do not block streets or drives.

STOP 2. Observe the Yorkville Till Member of the Wedron Formation in the low roadcut on the left (west) side of the road (near the center of the east edge, NE SW NE sec. 24, T44N, R6E, 3rd P.M., McHenry County, Woodstock 7.5-minute Quadrangle [42088C4]).

The Yorkville Till Member of the Wedron Formation exposed here consists of clayey, pebbly, somewhat silty, calcareous, brownish gray till. Although the fresh surface does not appear to have a great number of pebbles, They have become concentrated on the weathered surface giving the appearance of an exceedingly stony to gravelly deposit. Most pebbles are dolomite of Silurian age. Dolomite pebbles usually have some of the better developed scratches (striations) on their surfaces.

The Barlina Moraine has overridden the Gilberts Moraine here. The view to the west is down across a westward bulge of the Barlina, a narrow band of the Gilberts, and then across the outwash plain toward the Marengo Moraine about 3.5 miles away.

0.0	15.6+	Leave STOP 2 and CONTINUE AHEAD (north).
0.25+	15.9	Following the itinerary, we cross onto the Gilberts Moraine. Glacial cobbles and boulders used for driveways, fencecorners, and bank retainers have come from the local fields.
1.0+	16.9+	STOP: 2-way at Davis Road. TURN LEFT (west).
0.05+	16.95+	STOP: 1-way at intersection on curve. Continue AHEAD (west) on South Street.
0.75+	17.75	Prepare to turn RIGHT.
0.05	17.8	Cross drainage ditch.
0.1	17.9	TURN RIGHT (north) on Rose Farm Road. To the left at this road corner, a private drive leads to the Woodstock Station of the ANR Pipeline Company.


WOODSTOCK
Kishwaukee
SENECA
D O
CONSTRUCTION
UNDER
CITY PARK
Radio Tower
Olson Sch
Westwood Sch
High Sch
Fairground
Memorial Park
Gravel Pit
KISHWAUKEE VALLEY ROAD
DAVIS ROAD
ROSE FARM ROAD
CASTLE ROAD
PERKINS ROAD
LUCAS
STREET
ZIM
2
3
0 ½ 1 mi
0 ½ 1 1½ km

0.65 18.55+ PARK along right shoulder of the road. Enter Gaver and Sons Sand and Gravel Pit across the road only with permission.

STOP 3. Examine and collection of outwash sand and gravel of the Henry Formation (entrance, NW SE SE NE sec. 11, T44N, R6E, 3rd P.M., McHenry County, Woodstock 7.5-minute Quadrangle [42088C4]).

The sand and gravel being mined from this pit was carried into this area by Wisconsinan glaciers. This deposit is part of an extensive series of outwash fans that formed along the western margin of the Wisconsinan moraines in this part of northeastern Illinois. The material is called "outwash" because it was flushed out or carried beyond the glacier by meltwater torrents gushing off the top and front, and from beneath the ice sheet. Sometimes the flow was released in great bursts that often created new valleys and water-sculpted landforms. The glacier itself acted as a huge conveyor belt, bringing forward a continuous supply of rock and soil debris that was incorporated into the ice. The source of the debris came from anywhere along the flow of the glacier, some places as far north as Canada. Debris may also have been pushed along in front of the massive ice sheet.

This deposit originated when the margin of a northwest-southeast trending lobe of Wisconsinan ice was only a mile or so northeast of here. Torrential meltwater floods from this ice lobe were confined to the low land between the Marengo Moraine to the west and the ice front on the east. These floods spread out as they left the ice front forming braided streams that were overloaded with glacial debris. These streams, as they continually shifted their channels back and forth across the outwash fan, deposited and reworked the sand and gravel into relatively thin horizontal beds. The outwash fan or plain has a gentle slope southward toward the main Kishwaukee River. In places, hills of the Gilberts Moraine protrude up through the outwash deposits.

The sand and gravel deposit here is about 35 feet or so thick with about 20 feet below water level. Some large dolomite blocks of Silurian age have been retrieved from the bottom of the pond. These blocks have not been carried far because they still are fairly angular in shape. You will notice several of them just inside the entrance not far from the scalehouse. The majority, about 80 percent, of the rock debris in these outwash fans and plains is of local origin--Silurian dolomite from the west side of the Lake Michigan Basin. The remaining 20 percent or so is igneous and metamorphic rock debris from northern states and Canada. Many of the rocks show a high degree of rounding with some exhibiting scratches, called "striations," caused by rubbing against each other and against the bedrock surface over which they moved while frozen in the bottom of the ice.

The lower part of the exposed south wall of the pit shows interfingering lenses of sand and gravel (fig. 7) with scattered cobbles up to several inches in diameter. There is a sharp, irregular contact with the overlying medium brownish gray silt. This irregular contact, especially the concave-downward portion, is most likely the result of downwarping or collapse of the sand and gravel beds adjacent to slowiy melting detached blocks of glacial ice. The sand and gravel beds appear to parallel the contact with the overlying silt. After the outwash floods ceased, strong winds sweeping across the exposed outwash plain picked up and carried silt and clay across the new landscape to deposit them in areas such as this, which may have been covered by shallow lakes or ponds.

This brownish gray silt has a sharp upper contact with a surficial deposit of dark gray to black muck, a material that has a high percentage of finely divided, well-decomposed organic matter that is common in areas subjected to permafrost or in cold climate lake bottoms.

MATERIAL		MAXIMUM SIZE[a]		MINIMUM SIZE[b]	
		(in.)	(cm)	(in.)	(cm)
Silt and Clay (mud)		0.0029[c]	0.0074	no limit	no limit
Sand		0.187[d]	0.476	0.0029	0.0074
Gravel	Pebbles	2.5	6.4	0.187	0.476
	Cobbles	10.0	25.6	2.5	6.4
	Boulders	no limit	no limit	10.0	25.6

[a]Particles will pass through a sieve with square openings with the following side measurements.

[b]Particles will be retained on a sieve with square openings with the following side measurements.

[c]Number 200 mesh sieve.

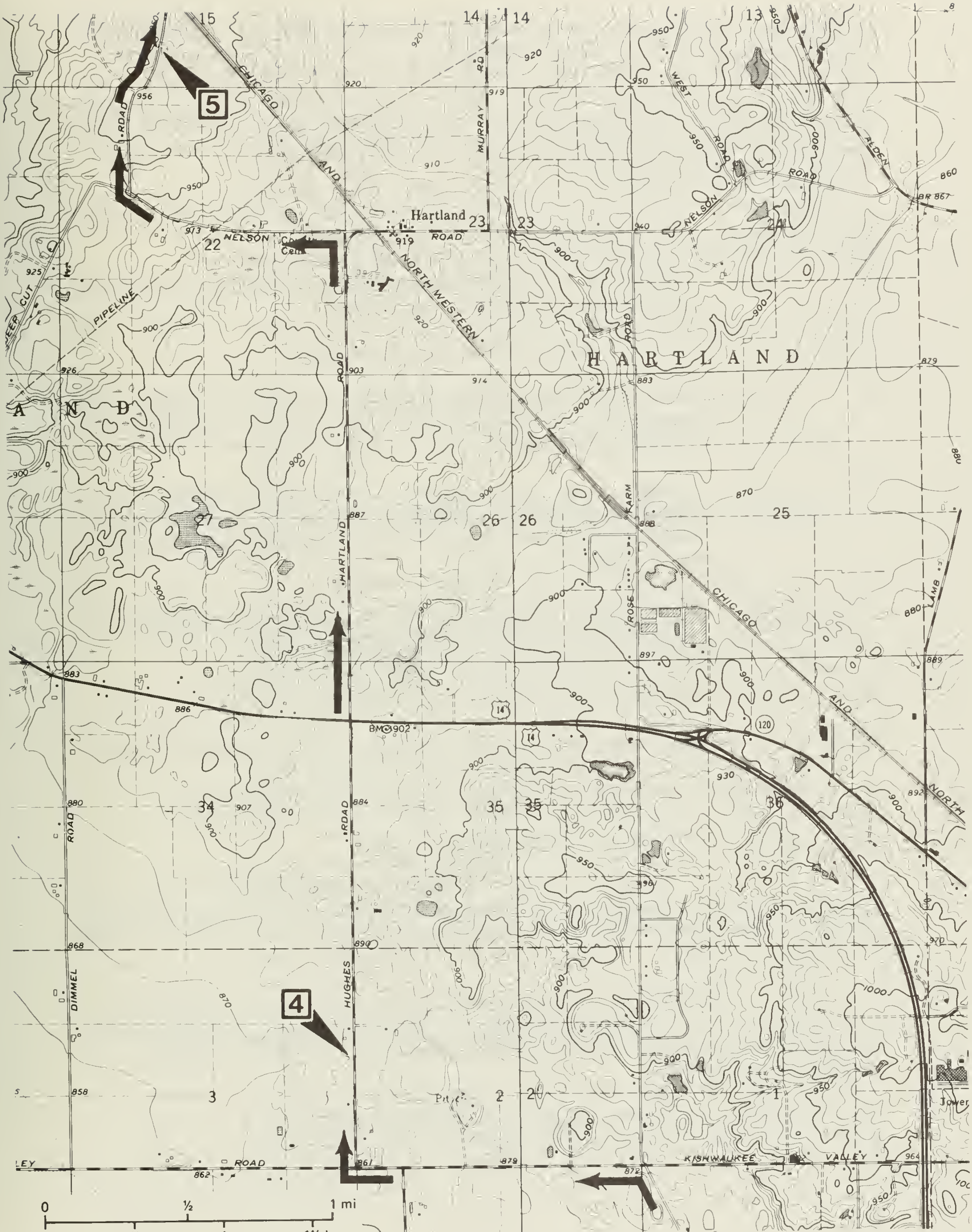
[d]Number 4 mesh sieve.

Figure 7 Particle-size names in general use by the sand and gravel industry (Masters, 1978).

0.0	18.55+	Leave STOP 3 and CONTINUE AHEAD (northward) on Rose Farm Road. The hills to the right (east) are part of the Woodstock Moraine.
0.7+	19.25+	STOP: 2-way at Kishwaukee Valley Road. TURN LEFT (west).
0.85	20.l+	Prepare to turn RIGHT.
0.1+	20.25+	TURN RIGHT (north) at T-road intersection onto Hughes Road.
0.35+	20.65+	PARK along right shoulder of the road.

STOP 4. Discuss glacial outwash fan (SW NW SW NW sec. 2, T44N, R6E, 3rd P.M., McHenry County, Marengo North 7.5-minute Quadrangle [42088C5]).

The area to the west and south is part of a fan-shaped, gently sloping deposit of glacial outwash debris called an outwash fan. We are located along the northwestern edge of the Gilberts Moraine and its outwash plain. The Woodstock Moraine has overridden the Gilberts about 0.3 miles north of this locality. Meltwater from the Woodstock glacier carried clay, silt, sand, gravel, cobbles, and boulders. The coarse materials were dumped fairly close to the ice front along the moraine or just out in front of the moraine. The finer materials were carried outside of this area; some of the finest eventually reached the Gulf of Mexico.



5
4
HARTLAND
Hartland
NELSON ROAD
CHICAGO AND NORTH WESTERN
CHICAGO AND NORTH
HARTLAND ROAD
HUGHES ROAD
DIMMEL ROAD
MURRAY RD
WEST ROAD
NELSON ROAD
ALDEN
ROSE FARM ROAD
LAMB
KISHWAUKEE VALLEY ROAD
PIPELINE
DEEP CUT
BM 902
0 ½ 1 mi
0 ½ 1 1½ km

The outwash fan formed here of the coarse debris from the Gilberts was later modified by Woodstock deposits. It is confined to a relatively narrow area about 3 miles wide at a maximum between the older Marengo Moraine to the west, the Woodstock Moraine to north and northeast, and the Gilberts Moraine to the east. The material flushed out of the ice here forced the North Branch of Kishwaukee River to be deflected westward close to the Marengo Moraine. As we continue on the route, you will have the opportunity to see additional fan-shaped deposits of outwash debris.

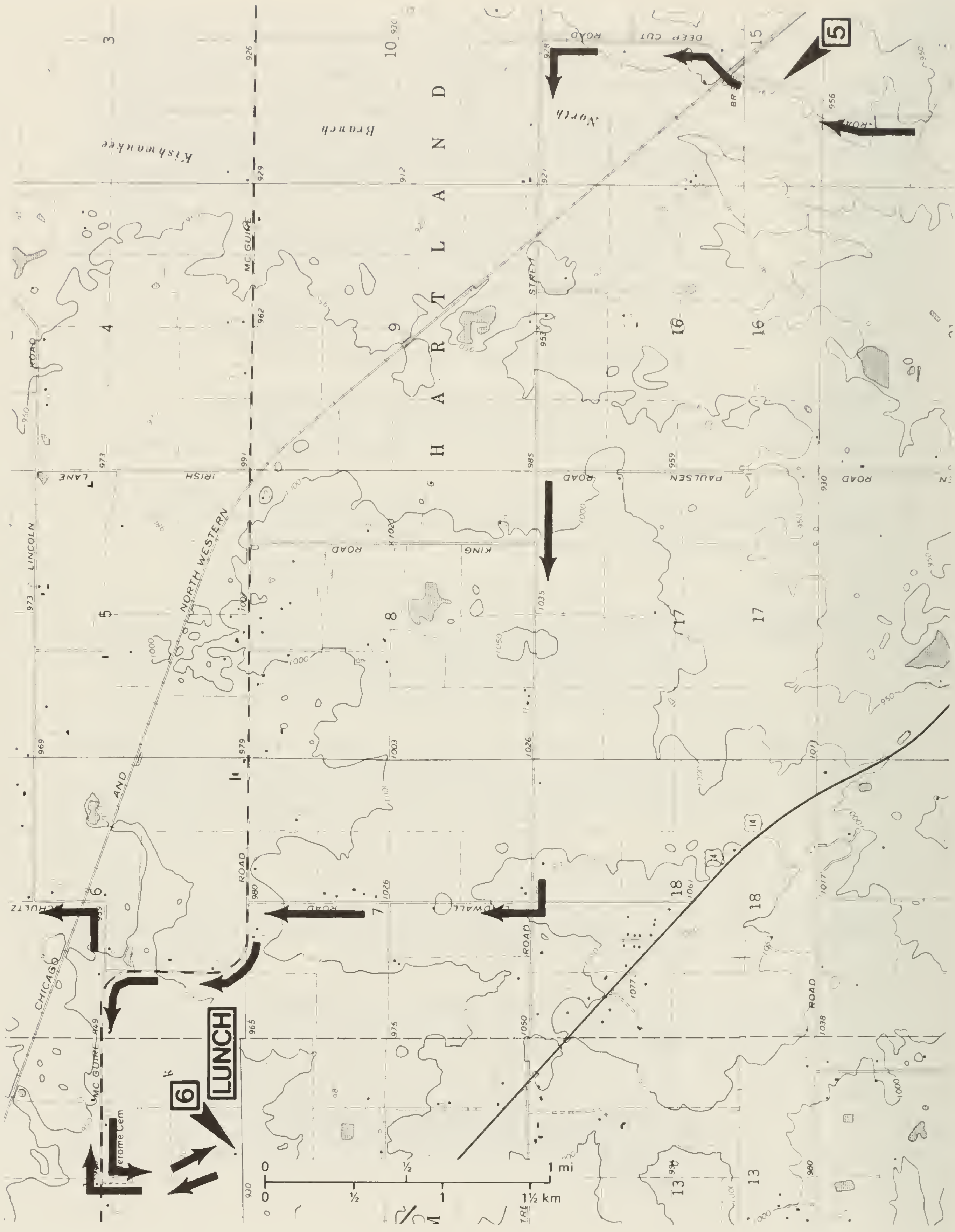
0.0	20.65+	Leave Stop 4 and CONTINUE AHEAD (north).
0.05+	20.75	To the left on the north side of the old silo, notice the boulder pile that has been collected from the nearby fields.
0.25+	21.0+	The road crosses onto the Woodstock Moraine.
0.4	21.4+	Across the field to the left about 0.35 miles is a kame, more than 30 feet higher than the road here. The kame stands along the front of the Woodstock Moraine.
0.15+	21.55+	In the field to the right, the topsoil has eroded away exposing the underlying stony till of the Woodstock Moraine. You will see a number of places where farming and erosion have produced similar results along the field trip route.
0.25+	21.8+	STOP: 2-way at crossroad with US 14. CONTINUE AHEAD (north) on Hartland Road. Use extreme CAUTION in crossing US 14: FAST TRAFFIC. Visibility is somewhat limited to the right.
1.6+	23.45+	CONTINUE AHEAD (north) when Hartland Road curves right.
0.05+	23.5+	STOP: 1-way at T-intersection with Nelson Road. TURN LEFT (west).
0.75+	24.3+	TURN RIGHT (north) on Deep Cut Road at T-road from right.
0.5+	24.8+	PARK along right shoulder of the road.

STOP 5. Examine the Wedron Formation, Haeger Till Member in the road cut to the right (SE NW SE SW sec. 15, T45N, R6E, 3rd P.M., McHenry County, Marengo North 7.5-minute Quadrangle [42088C5]).

The Haeger Till is yellow gray with a brownish cast at times. It is also calcareous, very sandy, pebbly, and silty. Cobbles and pebbles are fairly common here. The Haeger may be as much as 50 to 100 feet thick, but generally it is thinner. No attempt was made to ascertain its thickness here.

0.0	24.8+	Leave Stop 5. CONTINUE AHEAD (northerly).

0.15+	25.0+	CAUTION crossing the narrow wood and steel bridge over the railroad.
0.7+	25.7+	STOP: 1-way at T-intersection with Streit Road. TURN LEFT (west).
0.2+	25.95	CAUTION crossing the narrow bridge over the North Branch of the Kishwaukee River. This river also appears to be too small to have excavated the valley that extends through the Woodstock Moraine in this vicinity. The valley now occupied by North Branch extends completely through the Woodstock Moraine here and was formed by a subglacial stream channeling meltwater away from the ice sheet. This stream must have carried a large part of the outwash from the Woodstock glacier that was deposited across the area west of Stop 4.
0.35	26.3	To the right, at the end of the retaining wall by the barn, is a large pile of boulders carried in from nearby fields.
0.1+	26.4+	CAUTION: guarded double track C&NW railroad crossing.
1.05+	27.5	CAUTION: T-road (King Road) intersects from the right. CONTINUE AHEAD (west).
0.75	28.25	We are coming down off the Woodstock Moraine onto the Marengo Moraine.
0.3	28.55	We are coming up the back slope of the Marengo Moraine.
0.2	28.75	CAUTION: dangerous intersection with Lindwall Road. TURN RIGHT (north) on the blacktop. NOTE: the elevation of this corner is 1,064 feet msl. The high point of the Marengo Ridge, 1,080 feet msl, south and east of Harvard is located about 0.6 mile to the southwest.
0.75	29.5	Harvard can be viewed ahead of us (at about 10 o'clock on the horizon). At the bottom of the slope directly ahead is a small tongue of the Woodstock outwash in a breach of the Marengo Moraine. The high ground about 2.5 miles ahead is part of the Marengo Ridge (Moraine).
0.2+	29.7+	STOP: 1-way at T-intersection with McGuire Road. TURN LEFT (west). CAUTION: FAST TRAFFIC. Visibility is limited.
0.45+	30.2	You are coming down off the Marengo Moraine onto the Woodstock outwash tongue mentioned at mileage 29.5.
0.1+	30.3+	Cross Rush Creek and BEAR LEFT on McGuire Road.
0.7	31.0+	Prepare to turn LEFT on the west side of Jerome Cemetery.
0.1+	31.1+	TURN LEFT (south) into the Rush Creek Conservation Area (entrance: NE corner, sec. 1, T45N, R5E, 3rd P.M., McHenry County, Harvard 7.5-minute Quadrangle [42088D5]). Mileage figures will resume from this turn. CONTINUE AHEAD (south) across Rush Creek to the Lake View Shelter and PARK.



HARTLAND
CHICAGO AND NORTH WESTERN
Kishwaukee
North Branch
MC GUIRE
IRISH LANE
LINCOLN
KING ROAD
PAULSEN ROAD
DEEP CUT ROAD
STREET
Jerome Cem
LUNCH
5
6
0 ½ 1 mi
0 ½ 1 1½ km

STOP 6. LUNCH

0.0	31.1+	Leave the picnic area and retrace the route to the McGuire Road entrance. STOP: 1-way. TURN RIGHT (east) on McGuire Road.
0.6	31.7+	Prepare to BEAR LEFT onto Schultz Road from the curve to the right.
0.05+	31.8+	BEAR LEFT AND CONTINUE STRAIGHT on Schultz Road. CAUTION: FAST TRAFFIC from the southeast on McGuire Road.
0.35	32.15+	CAUTION: guarded C&NW railroad crossing.
0.15+	32.35+	T-road (Lincoln Road) intersects from right. CONTINUE AHEAD (north).
0.25+	32.6+	CAUTION: T-road (Brink Street) intersects from left. JOG RIGHT and then LEFT (north) on Schultz Road.
0.5+	33.15+	PARK along right shoulder of the road so as not to block gate to the left (west).

STOP 7. Examine and collect from Woodstock glacial outwash deposits of the Henry Formation in the Harvard Ready Mix pit. You MUST HAVE PERMISSION from the office in town on McGuire Road before you can enter this property (entrance gate: SE SE SE NW sec. 31, T46N, R6E, 3rd P.M., McHenry County, Harvard 7.5-minute Quadrangle [42088D5]).

The outwash deposit here lies in a subglacial channel complex that is more than 1 mile wide and cuts through both the Marengo and Woodstock Moraines. Meltwater flowing through this gap in the moraines flushed sand and gravel westward and southward down the present drainages of Mokeler and Rush Creeks, building outwash fans similar to that of the North Branch Kishwaukee River (Stops 3 and 4). A bedrock valley a short distance to the southeast of here may have produced a sag in the ice lobes when each of the moraines was being deposited. This sag could have been a focal point for in-ice meltwater flow, resulting in a major subglacial channel discharging through this area during the building of both moraines. Outwash associated with the Woodstock Moraine is considerably more coarse than that found with other moraines in this area. Leighton and others (1931) suggested that at least one, and perhaps two, older outwash deposits are buried beneath the Woodstock ground moraine in the eastern part of McHenry County and adjacent areas, where Woodstock ice could have incorporated some of the material into its load for transport.

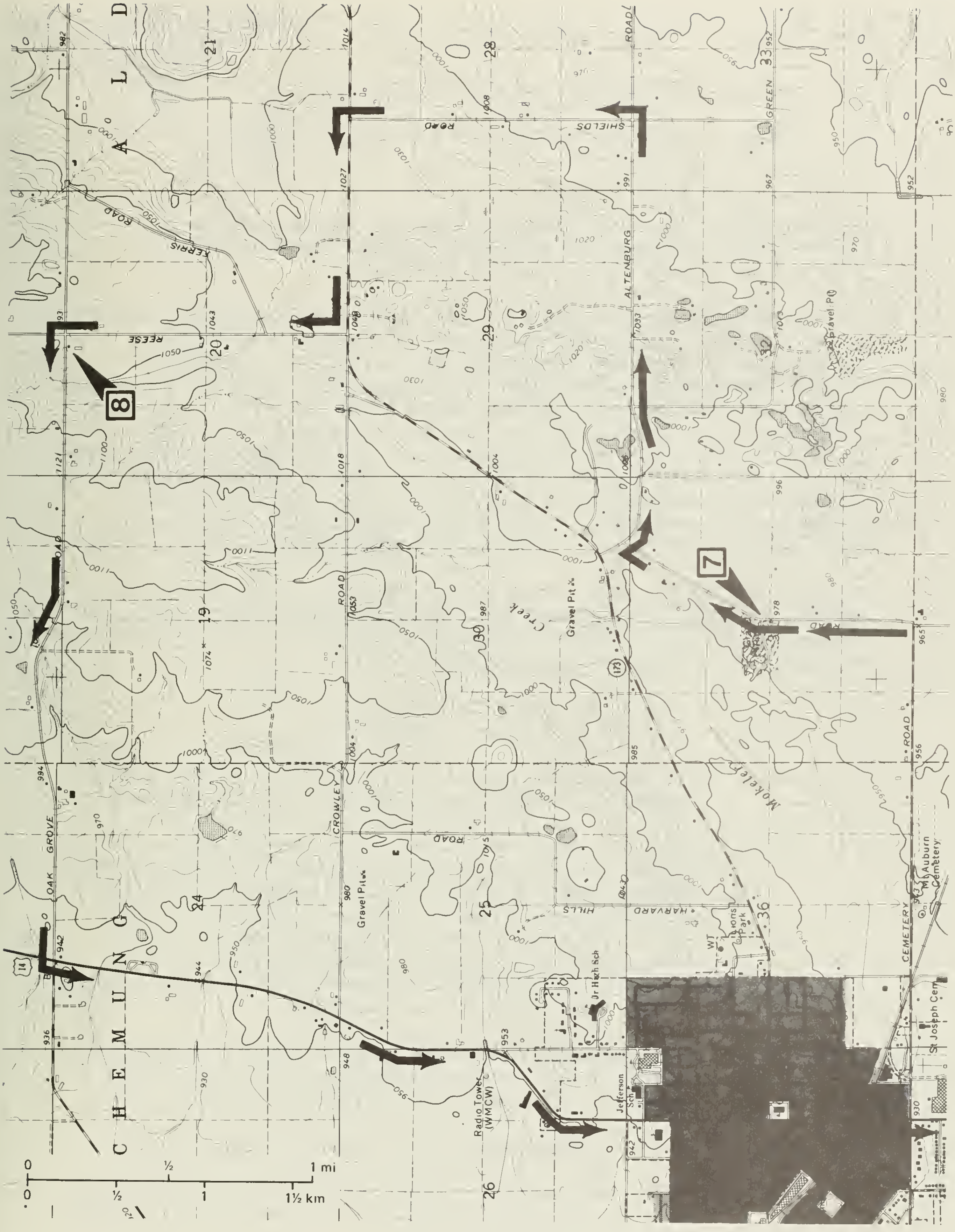
Anderson and Block (1962), in their work on gravel deposits in the county, noted that the Woodstock outwash here consists of coarse to very coarse, brown to gray sandy gravel under 2 to 5 feet of overburden. The deposit, which has a maximum thickness of about 20 feet, has some sand lenses that show crossbedding inclined to the northwest, but no evidence of slumping. Occasional patches of the pink Tiskilwa till that makes up the Marengo Moraine are unearthed at the base of the pit from to time as mining progresses.

More cobbles and small boulders (fig. 7, Stop 3) are present here than were observed at Stop 3. This is to be expected since this deposit is interpreted to be closer to the source of the outwash debris. Meltwater torrents rushing through confined courses along the bottom or within the ice had the power to move large boulders. Once the torrent escaped its confines and spread out, it lost its energy and ability to move large rocks--which dropped close to the head of the fan or outwash plain where the flow velocity decreased rapidly. So deposits became finer grained with increasing distance from the source. This location offers a greater variety of igneous and metamorphic rock types and sizes to collect than did Stop 3.

The last meltwater discharge through the area may have cut the valley now occupied by Mokeler Creek adjacent to this pit. About 2 miles northeast of here we will cross the divide between westward-flowing Mokeler Creek and an unnamed eastward-flowing tributary to Nippersink Creek that occupies the eastern part of the large valley for about 4 miles. This 4-mile reach of the valley is the visible evidence for the last position of a Woodstock lobe subglacial channel.

The outwash deposits in this area generally contain high-quality sand and gravel. Sand products (fine aggregate) may be used by the local construction industry in portland cement concrete, asphalt cemented pavement, and blacktop surfacing. Gravel products (coarse aggregate), as important as sand to the construction industry, are also in demand for landscaping and armor against erosion on steep banks.

0.0	33.15+	Leave Stop 7. CONTINUE AHEAD (northerly) on Schultz Road.
0.55+	33.7+	STOP: 1-way at T-intersection with Altenburg Road. TURN RIGHT (easterly). NOTE: for the next mile or so the route passes through an area showing as fine an example of knob and kettle topography as can be found in Illinois. These closely spaced hills and depressions are developed near the outer margin of the Woodstock Moraine where ice blocks detached from the main ice sheet were surrounded and buried by outwash debris. This topography is typically developed in gravelly moraines. Although there are local exceptions, Wisconsinan moraines older than the Woodstock Moraine, especially those in east-central Illinois, do not usually show well-developed knob and kettle topography.
1.4	35.1	Prepare to turn LEFT.
0.1	35.2	TURN LEFT (north) at the crossroad, Shields Road. Here the itinerary directs us across the backslope of the Woodstock Moraine. The topography rolls more gently than it did a short distance to the west.
0.95+	36.15+	STOP: 1-way at T-intersection with IL 173. TURN LEFT (west).
0.65	36.8+	Prepare to turn RIGHT.
0.1	36.9+	TURN RIGHT (north) at T-intersection, Reese Road, just before the highway curves left.
0.25+	37.2+	T-road (Ferris Road) angles from right. CONTINUE AHEAD (north). The route crosses a subglacial channel that carried meltwater southwestward beneath the Woodstock glacier. Mokeler Creek lies about 1,200 feet to the west and flows southwestward through the Woodstock and Marengo Moraines in this channel toward the Kishwaukee River. The small creek just ahead flows eastward in this channel toward Fox River via Nippersink Creek.



C H E M U N G
OAK GROVE ROAD
FERRIS ROAD
REESE
SHIELDS ROAD
GREEN
ALTENBURG ROAD
CROWLEY ROAD
HARVARD HILLS
CEMETERY ROAD
Mokeler Creek
Gravel Pit
Jr High Sch
Jefferson Sch
Radio Tower (WMCW)
Mt Auburn Cemetery
St Joseph Cem
Lyons Park
WT
8
7
0 ½ 1 mi
0 ½ 1 1½ km

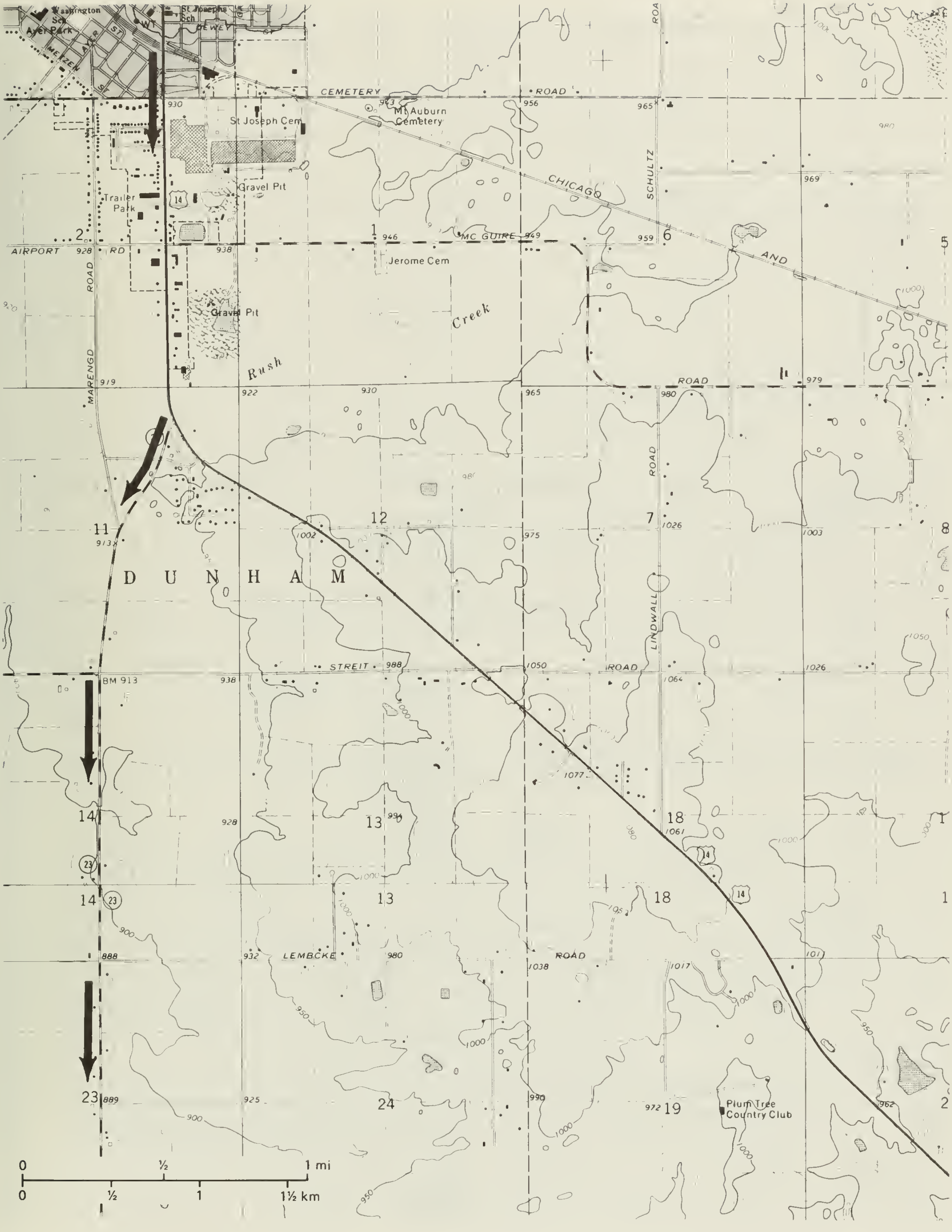
0.45	37.65+	To the right is an earth sheltered home.
0.25	37.9+	STOP: 2-way at crossroad, Oak Grove Road. TURN LEFT (west).
0.05	37.95+	PARK along right shoulder of the road. CAUTION: traffic may be heavy and fast at times.

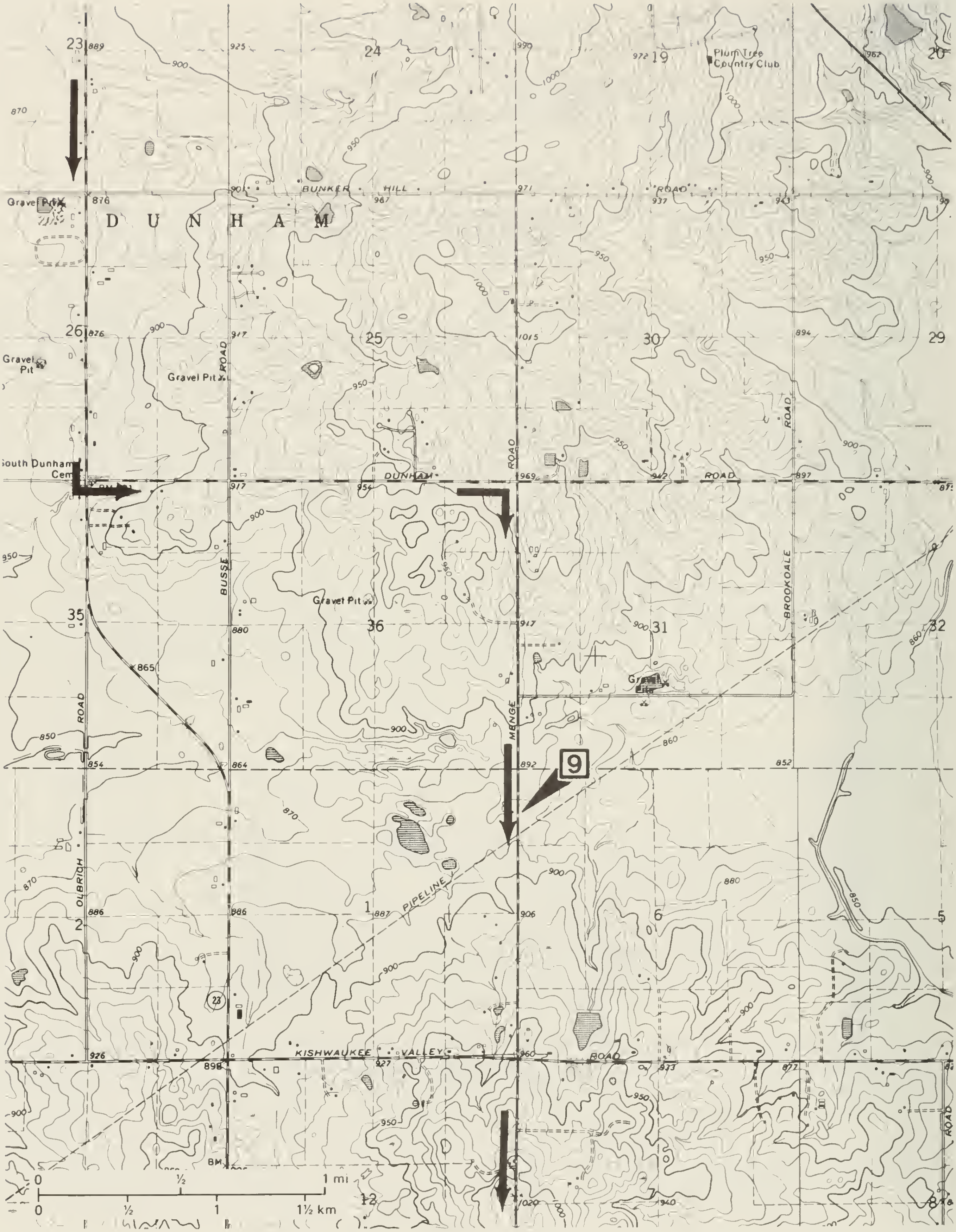
STOP 8. View and discuss the relationships between the Woodstock and Marengo Moraines in this vicinity (southern edge SE SE SE SW sec. 17, T46N, R6E, 3rd P.M., McHenry County, Harvard 7.5-minute Quadrangle [42088D5]).

The most spectacular event that happened in this vicinity was the coming of the Woodstock glacier. This glacier, advancing westward out of the Lake Michigan Basin, overrode a number of older moraines (Barlina and Gilberts) before riding up the backslope of the Marengo Moraine. Normally, a massive ice sheet would obliterate most evidence of previous glaciations in an area by incorporating their drifts into its own load or else by flattening and shoving them at least partly out of the way. Perhaps the Woodstock ice was thinner when it got to this area and thus did not have the power to do more than ride up the older moraine. The overall effect was to stack more drift onto the older moraine rather than to obliterate the earlier landform. A few miles north in southern Wisconsin, the Woodstock ice sheet completely overrode the Marengo Moraine. Several miles farther north, the Woodstock glacier overrode one of the Illinoian moraines that is situated west of the Marengo Moraine.

At this stop, the high part of the Woodstock Moraine is 1,100+ feet msl just to the north in the field. The highest point (1,189 feet msl) in this vicinity, however, is located 0.85 miles east-northeast from here. The highest elevation (1,153 feet msl) on the Marengo Moraine in the field trip area is situated 0.6 mile northwest of Stop 8.

0.0	37.95	Leave Stop 8 and CONTINUE AHEAD (west).
0.35	38.3+	To the right lies an exposure of pink Tiskilwa till found in the Marengo Moraine. The road climbs up the backslope of the Marengo Moraine.
0.2+	38.55	Cross the Marengo Moraine crest at an elevation of 1,130+ feet msl and begin to descend the frontal slope of the moraine. The local relief on the Marengo Ridge is about 225 feet or so, calulated as the difference in elevation between the crest and surface of the outwash fan a short distance west of US 14. The ridge lying about 6 miles ahead is an Illinoian moraine. Knob and kettle topography does not show on the Marengo the way it did on the Woodstock Moraine. Here it is much more subdued, more a "swell and swale" topography.
1.35+	39.9+	The frontal edge of the Marengo Moraine is masked by a series of outwash fans that extend west and south beyond US 14. Many fans overlap one another, giving the appearance of one large fan.
0.2	40.1+	STOP: 2-way at crossroad, US 14. TURN LEFT (south).
0.2	40.3+	View to the right shows the gentle slope of the outwash fans to the west.
1.0	41.3+	CAUTION: enter Harvard city limits.


Washington Sch
Ayer Park
St Joseph Sch
DEWEY
CEMETERY
ROAD
Mt Auburn Cemetery
St Joseph Cem
Gravel Pit
Trailer Park
CHICAGO
AND
SCHULTZ
AIRPORT
RD
MC GUIRE
Jerome Cem
Gravel Pit
Creek
Rush
MARENGO ROAD
ROAD
DUNHAM
STREIT
ROAD
LINDWALL ROAD
BM 913
LEMBCKE
ROAD
Plum Tree Country Club
0
½
1 mi
0
½
1
1½ km



Plum Tree Country Club
BUNKER HILL ROAD
Gravel Pit
DUNHAM
Gravel Pit
Gravel Pit
South Dunham Cem
DUNHAM ROAD
BUSSE ROAD
MENGE ROAD
BROOKDALE ROAD
OLBRICH ROAD
Gravel Pit
PIPELINE
KISHWAUKEE VALLEY ROAD
ROAD
9
23
24
19
20
26
25
30
29
35
36
31
32
2
1
6
5
12
8
0 ½ 1 mi
0 ½ 1 1½ km

1.45	42.75+	CAUTION: stoplight at intersection with IL 173. CONTINUE AHEAD (south) on US 14 and IL 173.
0.3	43.05+	C&NW railroad yards lie below the highway overpass.
0.2	43.25+	CAUTION: stoplight at intersection of Brink Street and IL 173 west. CONTINUE AHEAD (south) on US 14.
0.5	43.75+	CAUTION: stoplight at McGuire Road. CONTINUE AHEAD (south).
0.5	44.3+	Cross Rush Creek.
0.05+	44.4+	BEAR RIGHT (southerly) on IL 23.
3.8	48.2+	Prepare to turn LEFT.
0.1+	48.3+	TURN LEFT (east) on Dunham Road/McHenry County Route (McH) A29.
0.45+	48.8+	CAUTION: crossroad, Busse Road. CONTINUE AHEAD (east).
0.9	49.7+	Prepare to turn RIGHT.
0.1	49.8+	CAUTION: crossroad, Menge Road (McH A59). TURN RIGHT (south) and continue ahead for the next 6 miles.
0.2	50.0+	The route descends into a large subglacial channel that cuts across the Marengo Moraine from east to west.
0.85	50.85+	PARK along right shoulder of the road. DO NOT GET STUCK in the ditch. CAUTION: fast traffic.

STOP 9. Discuss the subglacial channel (NE NE NE NE sec. 1, T44N, R5E, 3rd P.M., McHenry County, Marengo North 7.5-minute Quadrangle [42088C5]).

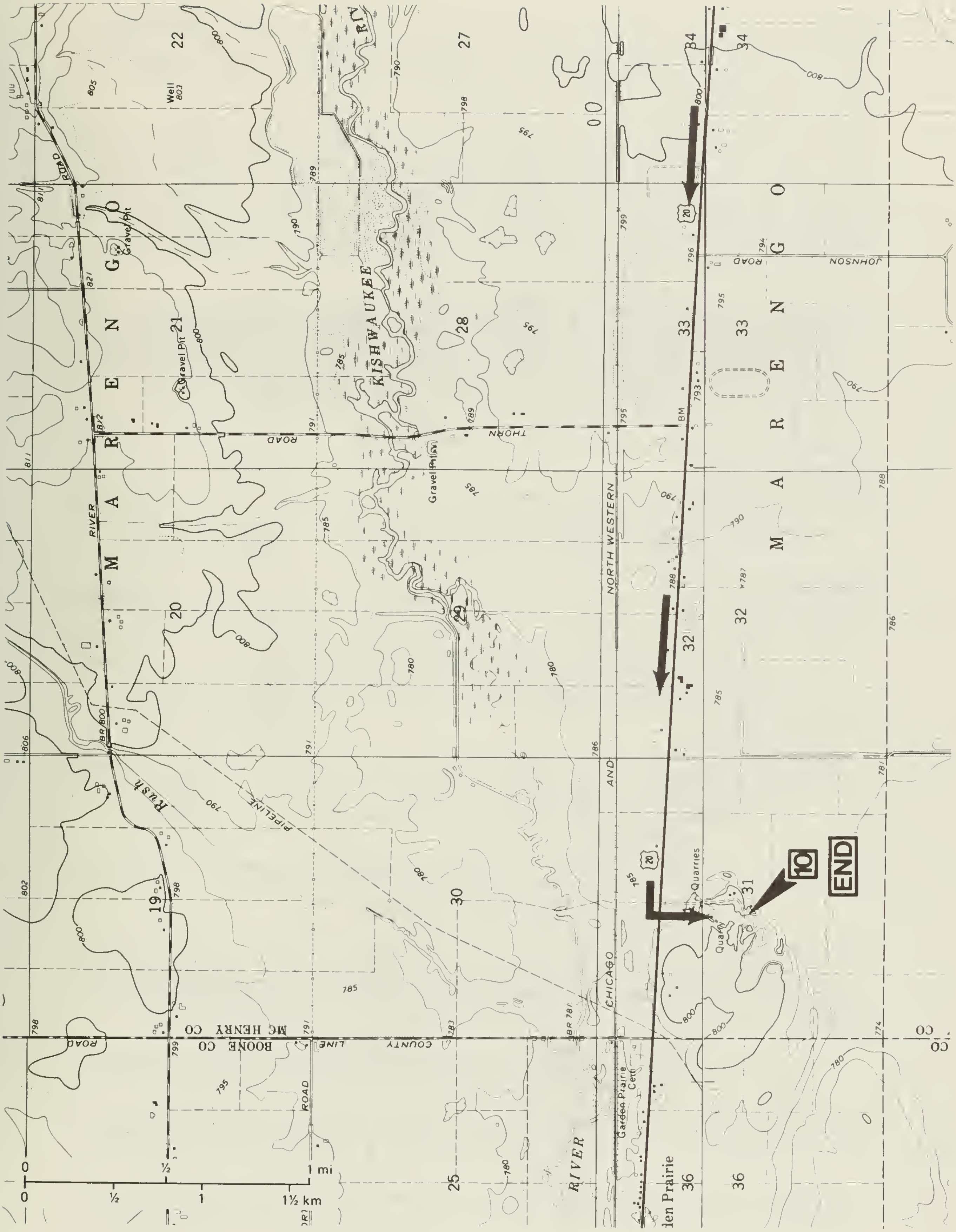
At first glance, one wonders...what is this landform? It has the appearance of a valley, yet no streams are visible along its bottom. Why is it located here? The most plausible explanation is that this deep depression or notch across the Marengo Moraine is a subglacial channel that once carried meltwater from under and in front of the Marengo ice sheet when it reached this locality and was depositing its moraine. At times, a subglacial channel is difficult to distinguish from a postglacial valley. In general, subglacial valley walls tend to exhibit the morainic topography that characterizes the adjacent moraine. Postglacial or modern valleys, on the other hand, tend to have smoother walls and bottoms. The roadway crosses the divide that separates eastward-flowing drainage to North Branch Kishwaukee River from westward-flowing drainage to Rush Creek.

Examination of the sand and gravel from several pits located along this notch shows that it is pinkish to reddish like the till that composes the Marengo Moraine. Younger outwash deposits are gray or brownish gray and are not found here. Therefore, later meltwater streams apparently did not use this channel.


KISHWAUKEE VALLEY ROAD
COLLINS ROAD
Radio Towers
BOCKMAN ROAD
SULLIVAN ROAD
STANDISH ROAD
DEER PASS ROAD
RIVER ROAD
MARENGO
Gravel Pit
KISHWAUKEE RIVER
Sewage Disposal Pond
Sewage Disposal
Sacred Heart Cem.
MILLSTREAM
Marengo
176
0
½
1 mi
0
½
1
1½ km

0.0	50.85+	Leave STOP 9. CONTINUE AHEAD (south).
0.9+	51.8+	STOP: 2-way at Kishwaukee Valley Road. CONTINUE AHEAD (south) on Deer Pass Road.
0.15+	52.0	The roadway ascends to the higher part of the Marengo Ridge.
0.8	52.8	CAUTION: offset crossroad, Collins Road. To the south, view the Kishwaukee River Valley, and to the east, the North Branch Kishwaukee River Valley. CONTINUE AHEAD (south).
0.5+	53.3+	CAUTION: T-intersection from left, Bockman Road. CONTINUE AHEAD (south).
0.3	53.6+	Route descends into Kishwaukee River Valley. View straight ahead shows the continuation of the Marengo Moraine on the south side of the Kishwaukee Valley.
0.8+	54.4+	CAUTION: crossroad, River Road. CONTINUE AHEAD (south).
0.7	55.1+	Cross Kishwaukee River.
0.25	55.35+	Black topsoil about 18 inches thick overlies a gravelly subsoil in this area.
0.4+	55.8	STOP: 1-way T-intersection with IL 176. TURN RIGHT (west) and enter Marengo City Limits.
0.35+	56.15+	TURN LEFT on Prospect Street.
0.45+	56.65+	CAUTION: guarded single main C&NW railroad crossing. Unguarded switch track lies to the south.
0.2	56.85+	Marengo High School appears on the left.
0.05+	56.95	STOP: 1-way at T-intersection with US 20. TURN RIGHT (northwest).
0.65+	57.6+	STOP: 4-way at junction with IL 23. CONTINUE AHEAD (westerly) on US 20.
1.3	58.9+	Valley train deposits left by glacial meltwater along the present Kishwaukee River consist of gravel, sand, and silt. Sand and silt exposed in freshly plowed fields in this area is easily blown away on windy days.
3.1+	62.05+	TURN LEFT (south) at entrance to Grant Pallet Company. PARK along access lane. Lane leads south to the pallet plant in an abandoned quarry and the owner's home on the southeast side of the quarry. YOU MUST HAVE PERMISSION to enter this property. See the owner at the house just beyond the pallet plant. Follow the leader(s) at this stop.
		CAUTION: LOOK where you put your feet. Nails from old, broken, and burned pallets may lie on the ground.


Marengo
Marengo
(BM 837)
KISHWAUKEE
KISHWAUKEE RIVER
Sewage Disposal Pond
Sewage Disposal
Sacred Heart Cem
Substation
High Sch
JOHNSON ROAD
MEYER ROAD
PLEASANT GROVE
CORP BDY
M A R E N G O
R E N G O
0 1 mi
0 1 1½ km


M A R E N G O
KISHWAUKEE
RIVER
Rush
PIPELINE
CHICAGO AND NORTH WESTERN
THORN ROAD
JOHNSON ROAD
RIVER ROAD
COUNTY LINE ROAD
BOONE CO
MC HENRY CO
Gravel Pit
Well 803
Quarries
Garden Prairie
Garden Prairie Cem
20
10
END
0 ½ 1 mi
0 ½ 1 1½ km

STOP 10. Examine Ordovician and Silurian bedrock and collect fossils from the exposed units (SE SE NE NW sec. 31, T44N, R5E, 3rd P.M., McHenry County, Garden Prairie 7.5-minute Quadrangle [42088C6]. The rest of the quarry is shown on the Riley 7.5-minute Quadrangle [42088B6]).

This locality has the distinction of having the only bedrock exposures in McHenry County. It is a bedrock high along the margin of the Kishwaukee River Valley where it stands about 25 feet above the general valley level. When the first geological surveys of the county were conducted during the 1860s, stone was being quarried here. Although not useful for all building purposes because of its chert content, it has proved useful as a general building stone for foundations, bridges, and similar construction.

The tan dolomite that was quarried on the east side of the lane is Silurian in age, deposited more than 430 million years ago. Underlying Ordovician strata of the Maquoketa Group, deposited less than 440 million years ago, are found in the southeastern part of the quarry.

The section of rocks exposed here at one time or another is as follows:

CENOZOIC ERATHEM	
Quaternary System	feet
Pleistocene Series	
Holocene Stage: soil--black, sandy, humic	3
Wisconsinan Stage: till and clayey sand--reddish	3-7
PALEOZOIC ERATHEM	
Silurian System	
Alexandrian Series	
Elwood Formation; dolomite--light brownish gray, weathers tan, fine grained, silty, thick to thin bedded, cherty, nonfossiliferous	15
Ordovician System	
Cincinnatian Series	
Richmondian Stage	
Maquoketa Shale Group	
Brainard Shale: shale--gray green, dolomitic, fossiliferous	2
Fort Atkinson Limestone: brownish, fine-grained dolomite and gray, argillaceous limestone; shaly and very fossiliferous, especially in the upper part, base concealed	15

The Ordovician rocks are fossiliferous here. You should be able to collect good specimens of corals, brachiopods, and bryozoa. (NOTE: a fossil plate is attached near the end of the booklet).

End of ISGS Geological Science Field Trip to the Woodstock Area.

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PLEISTOCENE GLACIATIONS IN ILLINOIS

Origin of the Glaciers

During the past million years or so, an interval of time called the Pleistocene Epoch, most of the northern hemisphere above the 50th parallel has been repeatedly covered by glacial ice. The cooling of the earth's surface, a prerequisite for glaciation, began at least 2 million years ago. On the basis of evidence found in subpolar oceans of the world (temperature-dependent fossils and oxygen-isotope ratios), a recent proposal has been made to recognize the beginning of the Pleistocene at 1.6 million years ago. Ice sheets formed in sub-arctic regions many times and spread outward until they covered the northern parts of Europe and North America. In North America, early studies of the glacial deposits led to the model that four glaciations could explain the observed distribution of glacial deposits. The deposits of a glaciation were separated from each other by the evidence of intervals of time during which soils formed on the land surface. In order of occurrence from the oldest to the youngest, they were given the names Nebraskan, Kansan, Illinoian, and Wisconsinan Stages of the Pleistocene Epoch. Work in the last 30 years has shown that there were more than four glaciations but the actual number and correlations at this time are not known. Estimates that are gaining credibility suggest that there may have been about 14 glaciations in the last one million years. In Illinois, estimates range from 4 to 8 based on buried soils and glacial deposits. For practical purposes, the previous four glacial stage model is functional, but we now know that the older stages are complex and probably contain more than one glaciation. Until we know more, all of the older glacial deposits, including the Nebraskan and Kansan will be classified as pre-Illinoian. The limits and times of the ice movement in Illinois are illustrated in the following pages by several figures.

The North American ice sheets developed when the mean annual temperature was perhaps 4° to 7°C (7° to 13°F) cooler than it is now and winter snows did not completely melt during the summers. Because the time of cooler conditions lasted tens of thousands of years, thick masses of snow and ice accumulated to form glaciers. As the ice thickened, the great weight of the ice and snow caused them to flow outward at their margins, often for hundreds of miles. As the ice sheets expanded, the areas in which snow accumulated probably also increased in extent.

Tongues of ice, called lobes, flowed southward from the Canadian centers near Hudson Bay and converged in the central lowland between the Appalachian and Rocky Mountains. There the glaciers made their farthest advances to the south. The sketch below shows several centers of flow, the general directions of flow from the centers, and the southern extent of glaciation. Because Illinois lies entirely in the central lowland, it has been invaded by glaciers from every center.

Effects of Glaciation

Pleistocene glaciers and the waters melting from them changed the landscapes they covered. The glaciers scraped and smeared the landforms they overrode, leveling and filling many of the minor valleys and even some of the larger ones. Moving ice carried colossal amounts of rock and earth, for much of what the glaciers wore off the ground was kneaded into the moving ice and carried along, often for hundreds of miles.

The continual floods released by melting ice entrenched new drainageways, deepened old ones, and then partly refilled both with sediments as great quantities of rock and earth were carried beyond the glacier fronts. According to some estimates, the amount of water drawn from the sea and changed into ice during a glaciation was enough to lower the sea level from 300 to 400 feet below present level. Consequently, the melting of a continental ice sheet provided a tremendous volume of water that eroded and transported sediments.

In most of Illinois, then, glacial and meltwater deposits buried the old rock-ribbed, low, hill-and-valley terrain and created the flatter landforms of our prairies. The mantle of soil material and the buried deposits of gravel, sand, and clay left by the glaciers over about 90 percent of the state have been of incalculable value to Illinois residents.

Glacial Deposits

The deposits of earth and rock materials moved by a glacier and deposited in the area once covered by the glacier are collectively called **drift**. Drift that is ice-laid is called **till**. Water-laid drift is called **outwash**.

Till is deposited when a glacier melts and the rock material it carries is dropped. Because this sediment is not moved much by water, a till is unsorted, containing particles of different sizes and compositions. It is also stratified (unlayered). A till may contain materials ranging in size from microscopic clay particles to large boulders. Most tills in Illinois are pebbly clays with only a few boulders. For descriptive purposes, a mixture of clay, silt, sand and boulders is called **diamicton**. This is a term used to describe a deposit that could be interpreted as till or a mass wasting product.

Tills may be deposited as **end moraines**, the arc-shaped ridges that pile up along the glacier edges where the flowing ice is melting as fast as it moves forward. Till also may be deposited as **ground moraines**, or **till plains**, which are gently undulating sheets deposited when the ice front melts back, or retreats. Deposits of till identify areas once covered by glaciers. Northeastern Illinois has many alternating ridges and plains, which are the succession of end moraines and till plains deposited by the Wisconsinan glacier.

Sorted and stratified sediment deposited by water melting from the glacier is called **outwash**. Outwash is bedded, or layered, because the flow of water that deposited it varied in gradient, volume, velocity, and direction. As a meltwater stream washes the rock materials along, it sorts them by size—the fine sands, silts, and clays are carried farther downstream than the coarser gravels and cobbles. Typical Pleistocene outwash in Illinois is in multilayered beds of clays, silts, sands, and gravels that look much like modern stream deposits in some places. In general, outwash tends to be coarser and less weathered, and alluvium is most often finer than medium sand and contains variable amounts of weathered material.

Outwash deposits are found not only in the area covered by the ice field but sometimes far beyond it. Meltwater streams ran off the top of the glacier, in crevices in the ice, and under the ice. In some places, the cobble-gravel-sand filling of the bed of a stream that flowed in the ice is preserved as a sinuous ridge called an **esker**. Some eskers in Illinois are made up of sandy to silty deposits and contain mass wasted diamicton material. Cone-shaped mounds of coarse outwash, called **kames**, were formed where meltwater plunged through crevasses in the ice or into ponds on the glacier.

The finest outwash sediments, the clays and silts, formed bedded deposits in the ponds and lakes that filled glacier-dammed stream valleys, the sags of the till plains, and some low, moraine-diked till plains. Meltwater streams that entered a lake rapidly lost speed and also quickly dropped the sands and gravels they carried, forming deltas at the edge of the lake. Very fine sand and silts were commonly redistributed on the lake bottom by wind-generated currents, and the clays, which stayed in suspension longest, slowly settled out and accumulated with them.

Along the ice front, meltwater ran off in innumerable shifting and short-lived streams that laid down a broad, flat blanket of outwash that formed an **outwash plain**. Outwash was also carried away from the glacier in valleys cut by floods of meltwater. The Mississiippi, Illinois, and Ohio Rivers occupy valleys that were major channels for meltwaters and were greatly widened and deepened during times of the greatest meltwater floods. When the floods waned, these valleys were partly filled with outwash far beyond the ice margins. Such outwash deposits, largely sand and gravel, are known as **valley trains**. Valley train deposits may be both extensive and thick. For instance, the long valley train of the Mississippi Valley is locally as much as 200 feet thick.

Loess, Eolian Sand and Soils

One of the most widespread sediments resulting from glaciation was carried not by ice or water but by wind. **Loess** is the name given to windblown deposits dominated by silt. Most of the silt was derived from wind erosion of the valley trains. Wind action also sorted out **eolian sand** which commonly formed **sand dunes** on the valley trains or on the adjacent uplands. In places, sand dunes have migrated up to 10 miles away from the principle source of sand. Flat areas between dunes are generally underlain by eolian **sheet sand** that is commonly reworked by water action. On uplands along the major valley trains, loess and eolian sand are commonly interbedded. With increasing distance from the valleys, the eolian sand pinches out, often within one mile.

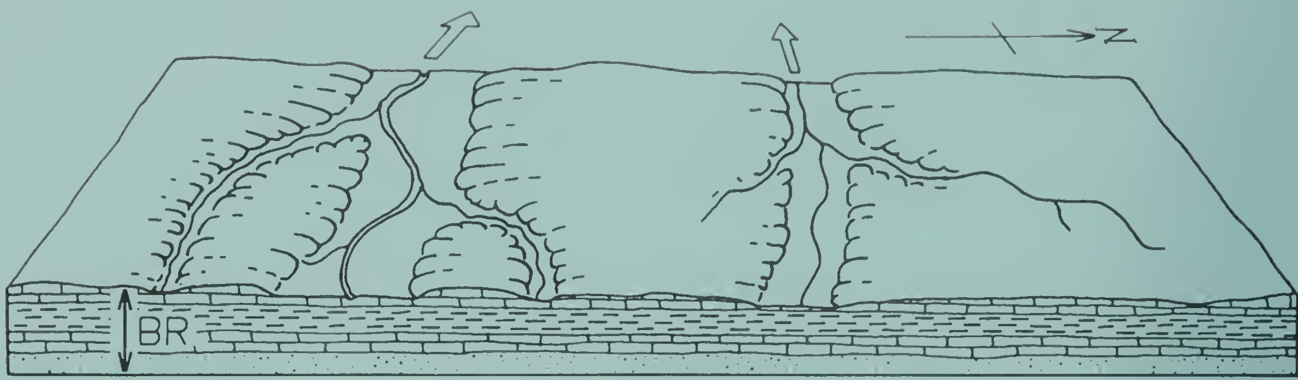
Eolian deposition occurred when certain climatic conditions were met, probably in a seasonal pattern. Deposition could have occurred in the fall, winter or spring season when low precipitation rates and low temperatures caused meltwater floods to abate, exposing the surfaces of the valley trains and permitting them to dry out. During Pleistocene time, as now, west winds prevailed, and the loess deposits are thickest on the east sides of the source valleys. The loess thins rapidly away from the valleys but extends over almost all the state.

Each Pleistocene glaciation was followed by an interglacial stage that began when the climate warmed enough to melt the glaciers and their snowfields. During these warmer intervals, when the climate was similar to that of today, drift and loess surfaces were exposed to weather and the activities of living things. Consequently, over most of the glaciated terrain, soils developed on the Pleistocene deposits and altered their composition, color, and texture. Such soils were generally destroyed by later glacial advances, but some were buried. Those that survive serve as "key beds," or stratigraphic markers, and are evidence of the passage of a long interval of time.

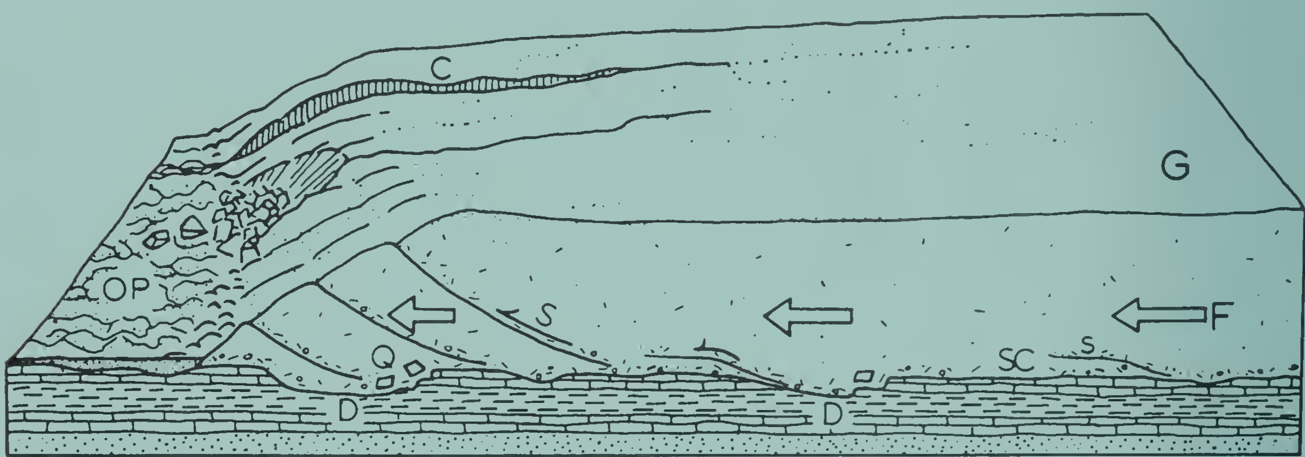
Glaciation in a Small Illinois Region

The following diagrams show how a continental ice sheet might have looked at various stages as it moved across a small region in Illinois. They illustrate how it could change the old terrain and create a landscape like the one we live on. To visualize how these glaciers looked, geologists study the landforms and materials left in the glaciated regions and also the present-day mountain glaciers and polar ice caps.

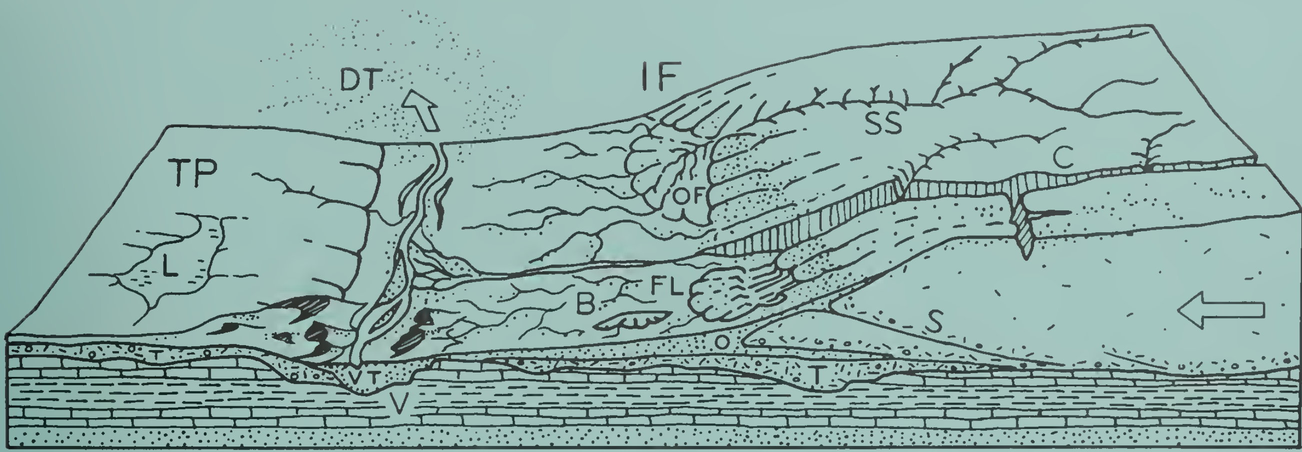
The block of land in the diagrams is several miles wide and about 10 miles long. The vertical scale is exaggerated—layers of material are drawn thicker and landforms higher than they ought to be so that they can be easily seen.



1. **The Region Before Glaciation** — Like most of Illinois, the region illustrated is underlain by almost flat-lying beds of sedimentary rocks—layers of sandstone ( ), limestone ( ), and shale ( ). Millions of years of erosion have planed down the bedrock (BR), creating a terrain of low uplands and shallow valleys. A residual soil weathered from local rock debris covers the area but is too thin to be shown in the drawing. The streams illustrated here flow westward and the one on the right flows into the other at a point beyond the diagram.



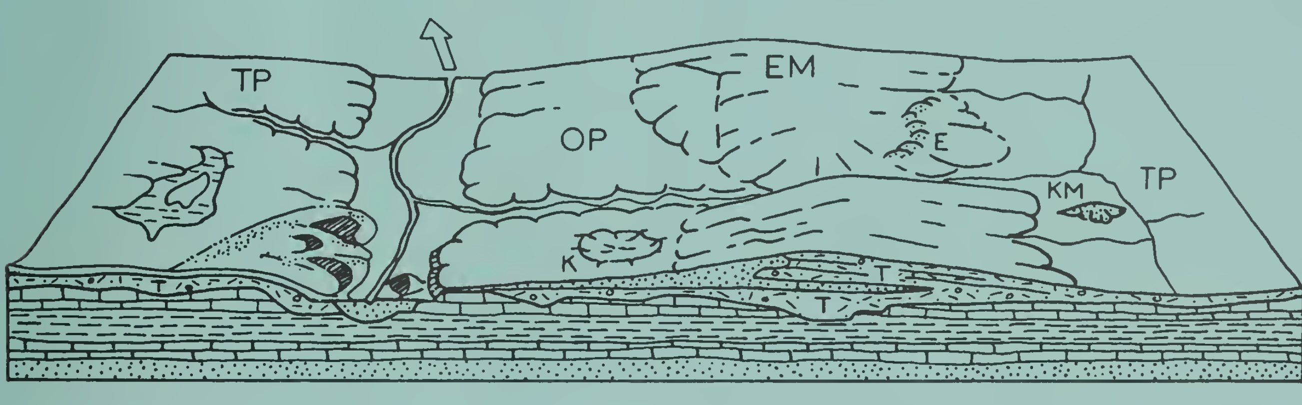
2. **The Glacier Advances Southward** — As the Glacier (G) spreads out from its ice snowfield accumulation center, it scours (SC) the soil and rock surface and quarries (Q)—pushes and plucks up—chunks of bedrock. The materials are mixed into the ice and make up the glacier's "load." Where roughnesses in the terrain slow or stop flow (F), the ice "current" slides up over the blocked ice on innumerable shear planes (S). Shearing mixes the load very thoroughly. As the glacier spreads, long cracks called "crevasses" (C) open parallel to the direction of ice flow. The glacier melts as it flows forward, and its meltwater erodes the terrain in front of the ice, deepening (D) some old valleys before ice covers them. Meltwater washes away some of the load freed by melting and deposits it on the outwash plain (OP). The advancing glacier overrides its outwash and in places scours much of it up again. The glacier may be 5000 or so feet thick, and tapers to the margin, which was probably in the range of several hundred feet above the old terrain. The ice front advances perhaps as much as a third of a mile per year.



3. **The Glacier Deposits an End Moraine** — After the glacier advances across the area, the climate warms and the ice begins to melt as fast as it advances. The ice front (IF) is now stationary, or fluctuating in a narrow area, and the glacier is depositing an end moraine.

As the top of the glacier melts, some of the sediment that is mixed in the ice accumulates on top of the glacier. Some is carried by meltwater onto the sloping ice front (IF) and out onto the plain beyond. Some of the debris slips down the ice front in a mudflow (FL). Meltwater runs through the ice in a crevasse (C). A supraglacial stream (SS) drains the top of the ice, forming an outwash fan (OF). Moving ice has overridden an immobile part of the front on a shear plane (S). All but the top of a block of ice (B) is buried by outwash (O).

Sediment from the melted ice of the previous advance (figure 2) remains as a till layer (T), part of which forms the till plain (TP). A shallow, marshy lake (L) fills a low place in the plain. Although largely filled with drift, the valley (V) remains a low spot in the terrain. As soon as the ice cover melts, meltwater drains down the valley, cutting it deeper. Later, outwash partly refills the valley: the outwash deposit is called a valley train (VT). Wind blows dust (DT) off the dry floodplain. The dust will form a loess deposit when it settles. Sand dunes (D) form on the south and east sides of streams.



4. **The Region after Glaciation** — As the climate warms further, the whole ice sheet melts, and glaciation ends. The end moraine (EM) is a low, broad ridge between the outwash plain (OP) and till plains (TP). Run-off from rains cuts stream valleys into its slopes. A stream goes through the end moraine along the channel cut by the meltwater that ran out of the crevasse in the glacier.

Slopewash and vegetation are filling the shallow lake. The collapse of outwash into the cavity left by the ice block's melting has made a kettle (K). The outwash that filled a tunnel draining under the glacier is preserved in an esker (E). The hill of outwash left where meltwater dumped sand and gravel into a crevasse or other depression in the glacier or at its edge is a kame (KM). A few feet of loess covers the entire area but cannot be shown at this scale.

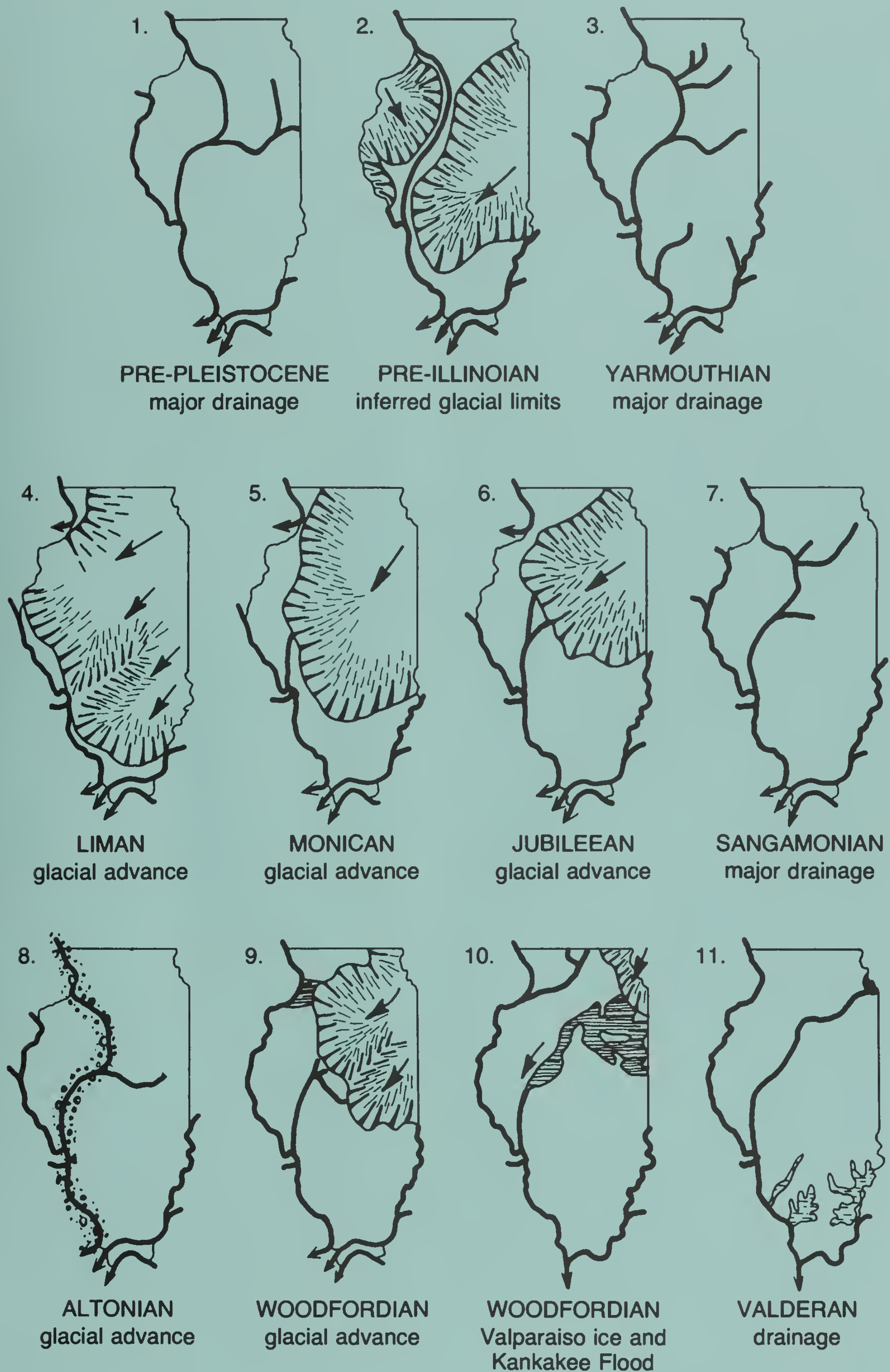
TIME TABLE OF PLEISTOCENE GLACIATION

		STAGE		SUBSTAGE	NATURE OF DEPOSITS	SPECIAL FEATURES
QUATERNARY		HOLOCENE (interglacial)		Years Before Present	Soil, youthful profile of weathering, lake and river deposits, dunes, peat	
				10,000		
	Pleistocene	WISCONSINAN (glacial)	late	Valderan	Outwash, lake deposits	Outwash along Mississippi Valley
				11,000		
				Twocreekan	Peat and alluvium	Ice withdrawal, erosion
				12,500		
				Woodfordian	Drift, loess, dunes, lake deposits	Glaciation; building of many moraines as far south as Shelbyville; extensive valley trains, outwash plains, and lakes
				25,000		
			mid	Farmdalian	Soil, silt, and peat	Ice withdrawal, weathering, and erosion
				28,000		
			early	Altonian	Drift, loess	Glaciation in Great Lakes area, valley trains along major rivers
				75,000		
		SANGAMONIAN (interglacial)			Soil, mature profile of weathering	Important stratigraphic marker
				125,000		
		ILLINOIAN (glacial)		Jubileean	Drift, loess, outwash	Glaciers from northeast at maximum reached Mississippi River and nearly to southern tip of Illinois
				Monican	Drift, loess, outwash	
				Liman	Drift, loess, outwash	
				300,000?		
		YARMOUTHIAN (interglacial)			Soil, mature profile of weathering	Important stratigraphic marker
				500,000?		
		Pre-Illinoian	KANSAN* (glacial)		Drift, loess	Glaciers from northeast and northwest covered much of state
				700,000?		
			AFTONIAN* (interglacial)		Soil, mature profile of weathering	(hypothetical)
				900,000?		
			NEBRASKAN* (glacial)	1,600,000 or more	Drift (little known)	Glaciers from northwest invaded western Illinois

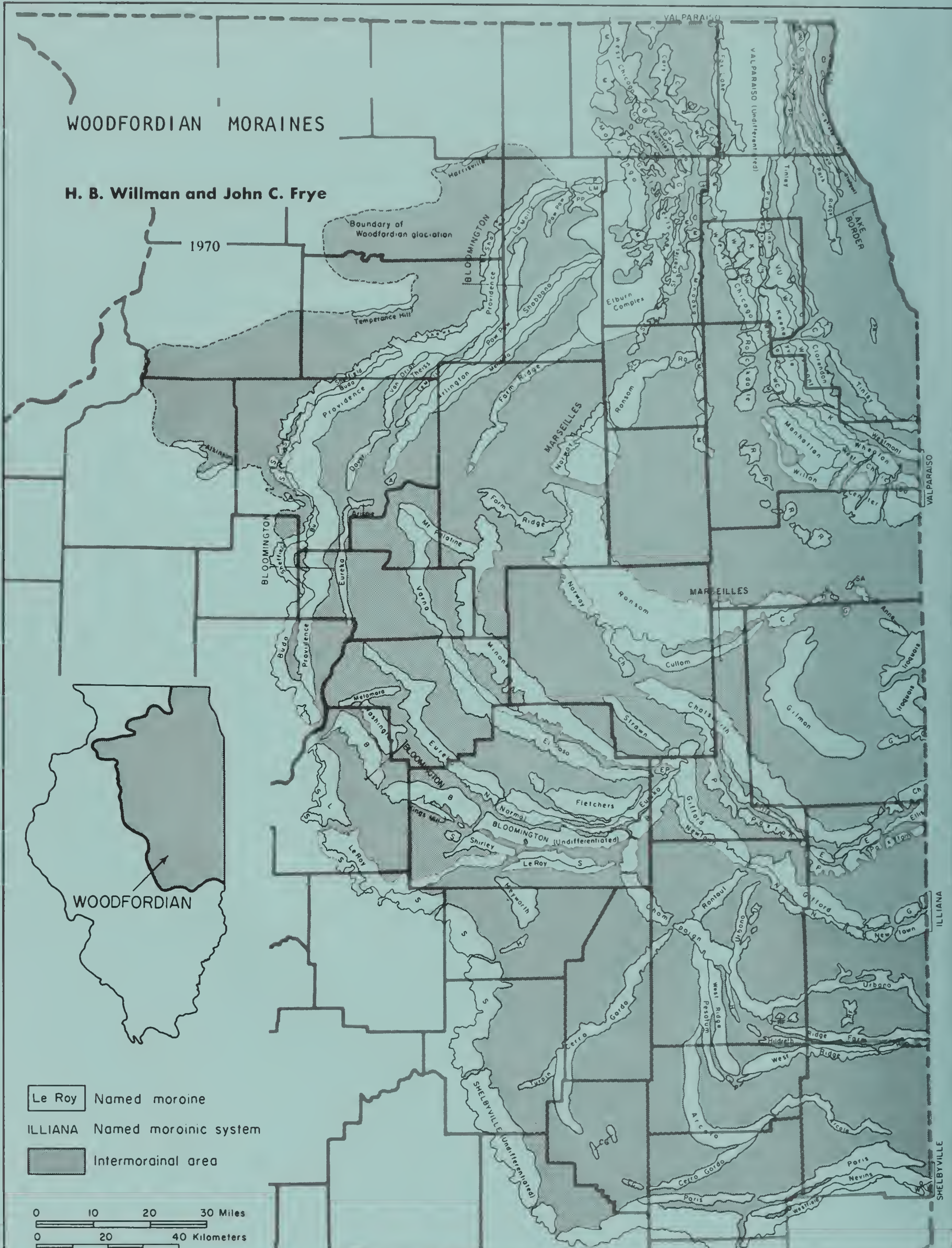
*Old oversimplified concepts, now known to represent a series of glacial cycles.

(Illinois State Geological Survey, 1973)

SEQUENCE OF GLACIATIONS AND INTERGLACIAL
DRAINAGE IN ILLINOIS



(Modified from Willman and Frye, "Pleistocene Stratigraphy of Illinois," ISGS Bull. 94, fig. 5, 1970.)


WOODFORDIAN MORAINES
H. B. Willman and John C. Frye
1970
Boundary of Woodfordian glaciation
VALPARAISO
VALPARAISO (Undifferentiated)
LAKE BORDER
BLOOMINGTON
MARSEILLES
ILLIANA
SHELBYVILLE
BLOOMINGTON (Undifferentiated)
SHELBYVILLE (Undifferentiated)
Elburn Complex
Temperance Hill
Harrisville
Providence
Shabbona
Farm Ridge
Arlington
Paw Paw
Dover
Mt Palatine
Varna
Eureka
Minonk
Ransom
Norway
Cullom
Chatsworth
Strawn
Gilman
Iroquois
El Paso
Fletchers
Normal
Shirley
Le Roy
Heyworth
Metamora
Washington
Kings Mill
Gifford
Newton
Paxton
Rantoul
Urbana
West Ridge
Pesotum
Cerro Gordo
Arcola
Paris
Nevins
Westfield
Hildreth
Ridge Farm
Manhattan
Wilton
Wheaton
Westmont
Tinley
Clarendon
Rockdale
Keeneyville
Chicago
WOODFORDIAN
Le Roy Named moraine
ILLIANA Named morainic system
Intermorainal area
0 10 20 30 Miles
0 20 40 Kilometers

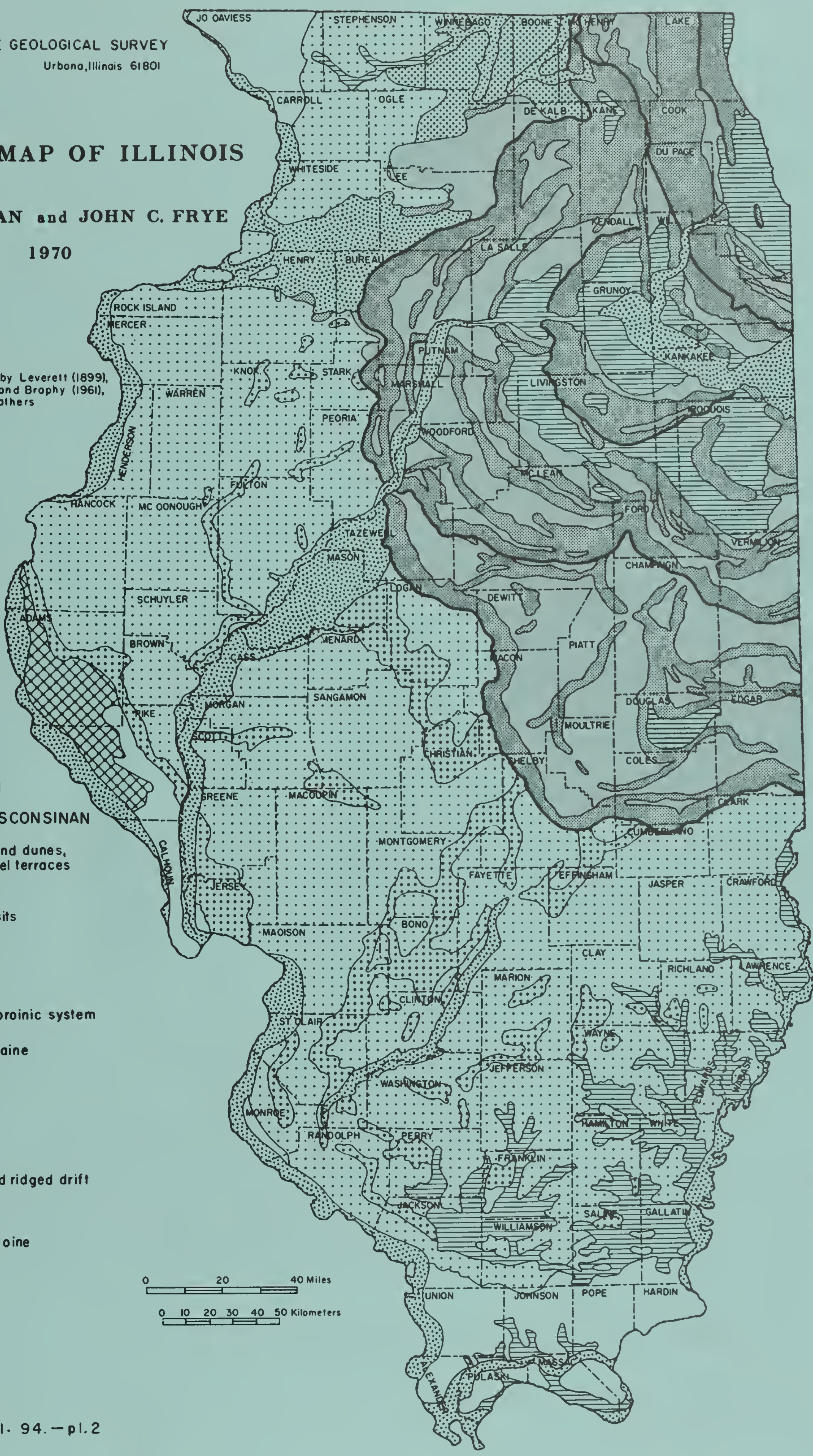
ILLINOIS STATE GEOLOGICAL SURVEY
John C. Frye, Chief   Urbana, Illinois 61801

GLACIAL MAP OF ILLINOIS

H. B. WILLMAN and JOHN C. FRYE

1970

Modified from maps by Leverett (1899), Ekblow (1959), Leighton and Brophy (1961), Willman et al. (1967), and others



EXPLANATION

HOLOCENE AND WISCONSINAN

Alluvium, sand dunes, and gravel terraces

WISCONSINAN

Lake deposits

WOODFORDIAN

Moraine

Front of morainic system

Groundmoraine

ALTONIAN

Till plain

ILLINOIAN

Moraine and ridged drift

Groundmoraine

KANSAN

Till plain

DRIFTLESS

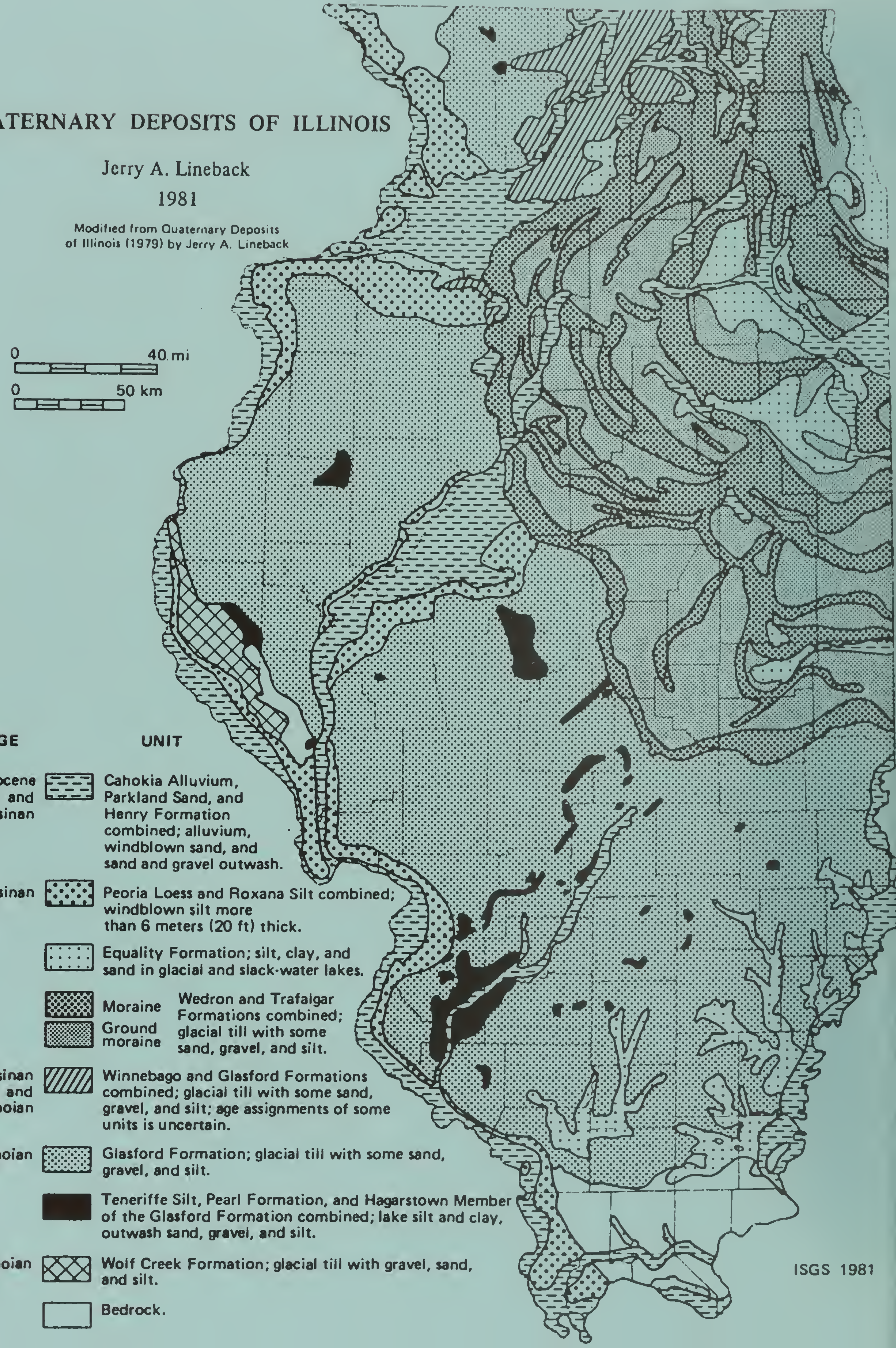
Modified from Bull. 94.—pl. 2

QUATERNARY DEPOSITS OF ILLINOIS

Jerry A. Lineback

1981

Modified from Quaternary Deposits of Illinois (1979) by Jerry A. Lineback



AGE	UNIT
Holocene and Wisconsinan	Cahokia Alluvium, Parkland Sand, and Henry Formation combined; alluvium, windblown sand, and sand and gravel outwash.
Wisconsinan	Peoria Loess and Roxana Silt combined; windblown silt more than 6 meters (20 ft) thick.
	Equality Formation; silt, clay, and sand in glacial and slack-water lakes.
	Moraine / Ground moraine — Wedron and Trafalgar Formations combined; glacial till with some sand, gravel, and silt.
Wisconsinan and Illinoian	Winnebago and Glasford Formations combined; glacial till with some sand, gravel, and silt; age assignments of some units is uncertain.
Illinoian	Glasford Formation; glacial till with some sand, gravel, and silt.
	Teneriffe Silt, Pearl Formation, and Hagarstown Member of the Glasford Formation combined; lake silt and clay, outwash sand, gravel, and silt.
Pre-Illinoian	Wolf Creek Formation; glacial till with gravel, sand, and silt.
	Bedrock.

ILLINOIS STATE GEOLOGICAL SURVEY
Urbana, Illinois 61801

GEOGRAM 2
October 1974

ERRATICS ARE ERRATIC

Myrna M. Killey

You may have seen them scattered here and there in Illinois—boulders, some large, some small, lying alone or with a few companions in the corner of a field, at the edge of a road, in someone's yard, or perhaps on a courthouse lawn or schoolyard. Many of them seem out of place, like rough, alien monuments in the stoneless, grassy knolls and prairies of our state. Some—the colorful and glittering granites, banded gneisses, and other intricately veined and streaked igneous and metamorphic rocks—are indeed foreign rocks, for they came from Canada and the states north of us. Others—gray and tan sedimentary rocks—are native rocks and may be no more than a few miles from their place of origin. All of these rocks are glacial boulders that were moved to their present sites by massive ice sheets that flowed across our state. If these boulders are unlike the rocks in the quarries and outcrops in the region where they are found, they are called erratics.

The continental glaciers of the Great Ice Age scoured and scraped the land surface as they advanced, pushing up chunks of bedrock and grinding them against each other or along the ground surface as the rock-laden ice sheets pushed southward. Hundreds of miles of such grinding, even on such hard rocks as granite, eventually rounded off the sharp edges of these passengers in the ice until they became the rounded, irregular boulders we see today. Although we do not know the precise manner in which erratics reached their present isolated sites, many were probably dropped directly from the melting front of a glacier. Others may have been rafted to their present resting places by icebergs on ancient lakes or on the floodwaters of some long-vanished stream as it poured from a glacier. Still others, buried in the glacial deposits, could have worked their way up to the land surface as the surrounding loose soil repeatedly froze and thawed. When the freezing ground expands, pieces of rock tend to be pushed upward, where they are more easily reached by the farmer's plow and also more likely to be exposed by erosion.

An eight-foot boulder of pink granite left by a glacier in the bed of a creek about 5 miles southwest of Alexis, Warren County, Illinois. (From ISGS Bulletin 57, 1929.)

Generally speaking, erratics found northeast of a line drawn from Freeport in Stephenson County, southward through Peoria, and then southeastward through Shelbyville to Marshall at the east edge of the state were brought in by the last glacier to enter Illinois. This glaciation, called the Wisconsinan, spread southwestward into Illinois from a center in eastern Canada, reaching our state about 75,000 years ago and (after repeated advances and retreats of the ice margin) melting from the state about 12,500 years ago. Erratics to the west or south of the great arc outlined above were brought in by a much older glacier, the Illinoian, which spread over most of the state about 300,000 to 175,000 years ago. Some erratics were brought in by even older glaciers that came from the northwest.

You may be able to locate some erratics in your neighborhood. Sometimes it is possible to tell where the rock originally came from by determining the kind of rock it is. A large boulder of granite, gneiss, or other igneous or metamorphic rock may have come from the Canadian Shield, a vast area in central and eastern Canada where rocks of Precambrian age (more than 600 million years old) are exposed at the surface. Some erratics containing flecks of copper were probably transported here from the "Copper Range" of the upper peninsula of Michigan. Large pieces of copper have been found in glacial deposits of central and northern Illinois. Light gray to white quartzite boulders with beautiful, rounded pebbles of red jasper came from a very small outcrop area near Bruce Mines, Ontario, Canada. Purplish pieces of quartzite, some of them banded, probably originated in the Baraboo Range of central Wisconsin. Most interesting of all are the few large boulders of Canadian tillite. Tillite is lithified (hardened into rock) glacial till deposited by a Precambrian glacier many millions of years older than the ones that invaded our state a mere few thousand years ago. Glacial till is an unsorted and unlayered mixture of clay, sand, gravel, and boulders that vary widely in size and shape. Tillite is a gray to greenish gray rock containing a mixture of grains of different sizes and scattered pebbles of various types and sizes.

Many erratics are of notable size and beauty, and in parts of Illinois they are commonly used in landscaping. Some are used as monuments in courthouse squares, in parks, or along highways. Many are marked with metal plaques to indicate an interesting historical spot or event. Keep an eye out for erratics. There may be some of these glacial strangers in your neighborhood that would be interesting to know.

ILLINOIS STATE GEOLOGICAL SURVEY
Urbana, Illinois 61801

GEOGRAM 5
October 1975

ANCIENT DUST STORMS IN ILLINOIS

Myrna M. Killey

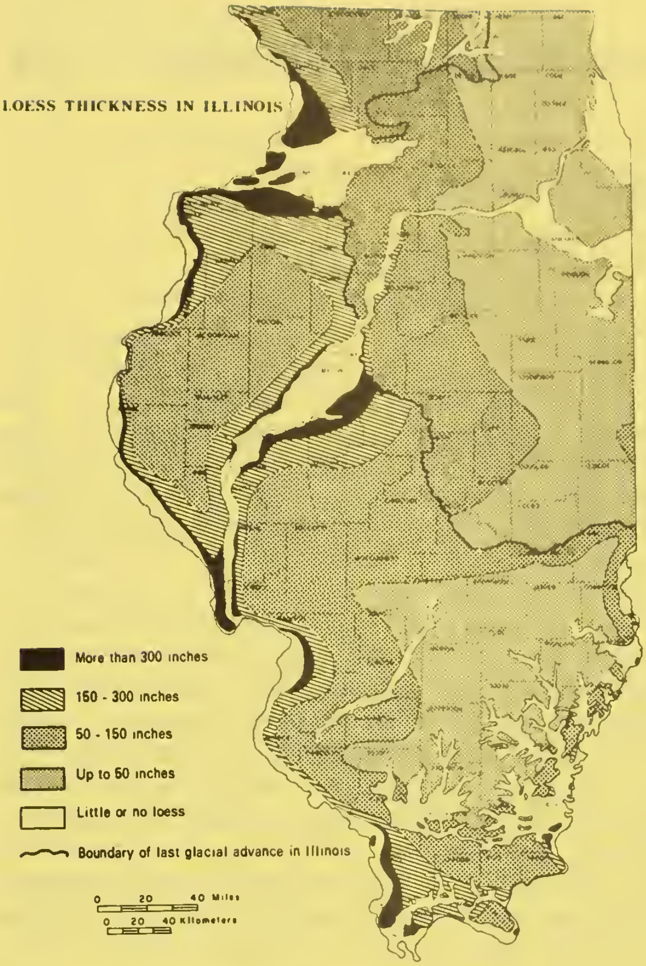
Fierce dust storms whirled across Illinois long before human beings were here to record them. Where did all the dust come from? Geologists have carefully put together clues from the earth itself to get the story. As the glaciers of the Great Ice Age scraped and scoured their way southward across the landscape from Canada, they moved colossal amounts of rock and earth. Much of the rock ground from the surface was kneaded into the ice and carried along, often for hundreds of miles. The glaciers acted as giant grist mills, grinding much of the rock and earth to "flour"—very fine dust-sized particles.

During the warm seasons, water from the melting ice poured from the glacier front, laden with this rock flour, called silt. In the cold months the meltwater stopped flowing and the silt was left along the channels the water had followed, where it dried out and became dust. Strong winds picked up the dust, swept it from the floodplains, and carried it to adjacent uplands. There the forests along the river valleys trapped the dust, which became part of the moist forest soil. With each storm more material accumulated until the high bluffs adjacent to major rivers were formed. The dust deposits are thicker along the eastern sides of the valleys than they are on the western sides, a fact from which geologists deduce that the prevailing winds of that time blew from west to east, the same direction as those of today. From such clues geologists conclude that the geologic processes of the past were much like those of today.

The deposits of windblown silt are called loess (rhymes with "bus"). Loess is found not only in the areas once covered by the glaciers but has been blown into the nonglaciated areas. The glaciers, therefore, influenced the present land surface well beyond the line of their farthest advance.

Loess has several interesting characteristics. Its texture is so fine and uniform that it can easily be identified in roadcuts—and because it blankets such a vast area many roads are cut through it. Even more noticeable is its tendency to stand in vertical walls. These steep walls develop as the loess drains and becomes tough, compact, and massive, much like a rock. Sometimes cracks develop in the loess, just as they do in massive limestones and sandstones. Loess makes good highway banks if it is cut vertically. A vertical cut permits maximum drainage because little surface is exposed to rain, and rainwater tends to drain straight down through it to the rock underneath. If the bank is cut at an angle more water soaks in, which causes the loess to slump down. Along Illinois roads the difference between a loess roadcut and one in ordinary glacial till is obvious. The loess has a very uniform texture, while the till is composed of a random mixture of rock debris, from clay and silt through cobbles and boulders.

Many loess deposits are worth a close look. Through a 10-power hand lens separate grains can be seen, among them many clear, glassy, quartz grains. Some loess deposits contain numerous rounded, lumpy stones called concretions. Their formation began when water percolating through the loess dissolved tiny



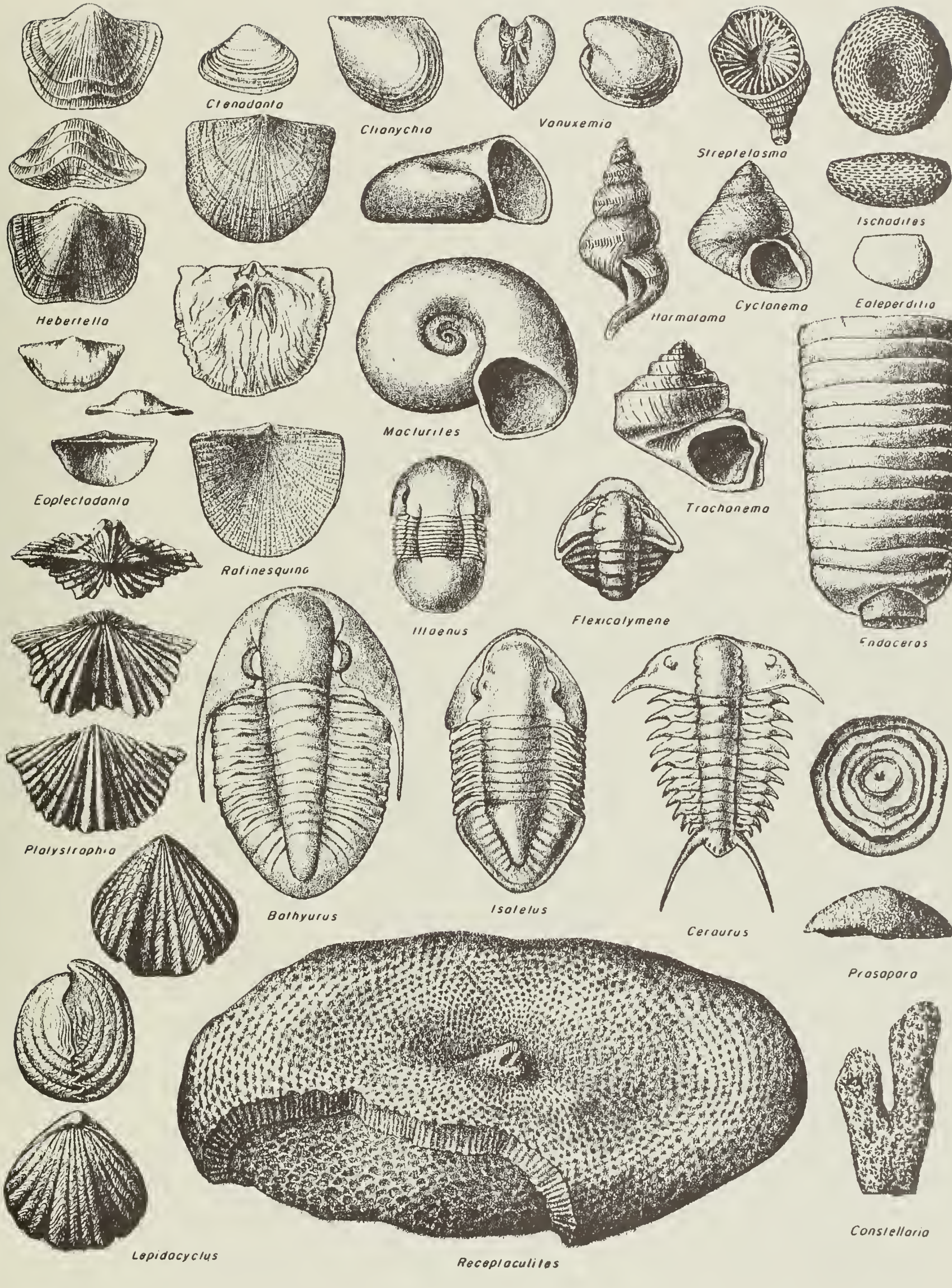
limestone grains. Some of the dissolved minerals later became solid again, gathering around a tiny nucleus or along roots to form the lumpy masses. A few such concretions are shaped roughly like small dolls and, from this resemblance, are called "loess kindchen," a German term meaning "loess children." They may be partly hollow and contain smaller lumps that make them rattle when shaken.

Fossil snails can be found in some loess deposits. The snails lived on the river bluffs while the loess was being deposited and were buried by the dust. When they are abundant, they are used to determine how old the loess is. The age is found by measuring the amount of radioactive carbon in the calcium carbonate of their shells.

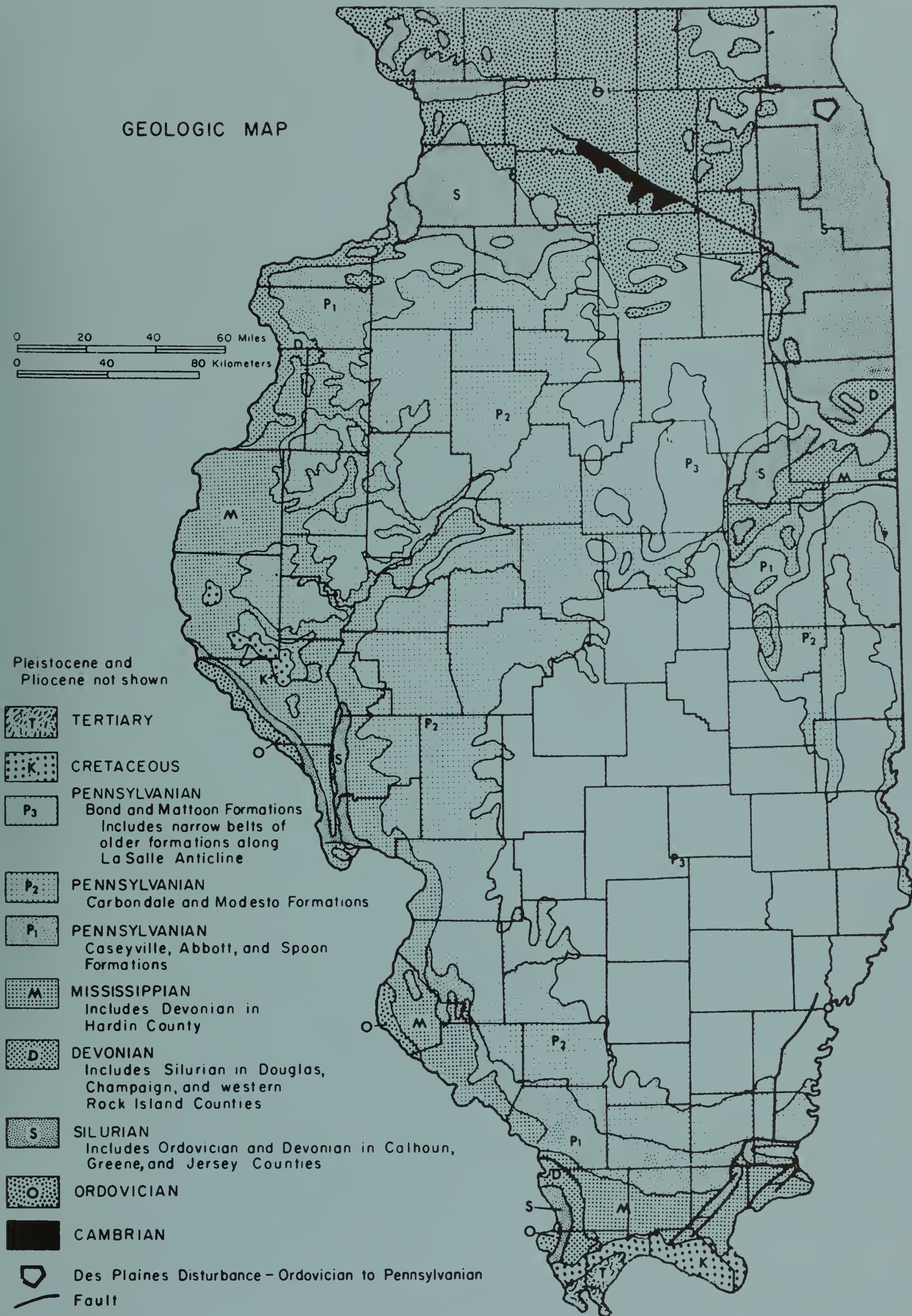
Some of the early loess deposits were covered by new layers of loess following later glacial invasions. Many thousands of years passed between the major glacial periods, during which time the climate was as warm as that of today. During the warm intervals, the surface of the loess and other glacial deposits was exposed to weather. Soils developed on most of the terrain, altering the composition, color, and texture of the glacial material. During later advances of the ice, some of these soils were destroyed, but in many places they are preserved under the younger sediments. Such ancient buried soils can be used to determine when the materials above and below them were laid down by the ice and what changes in climate took place.

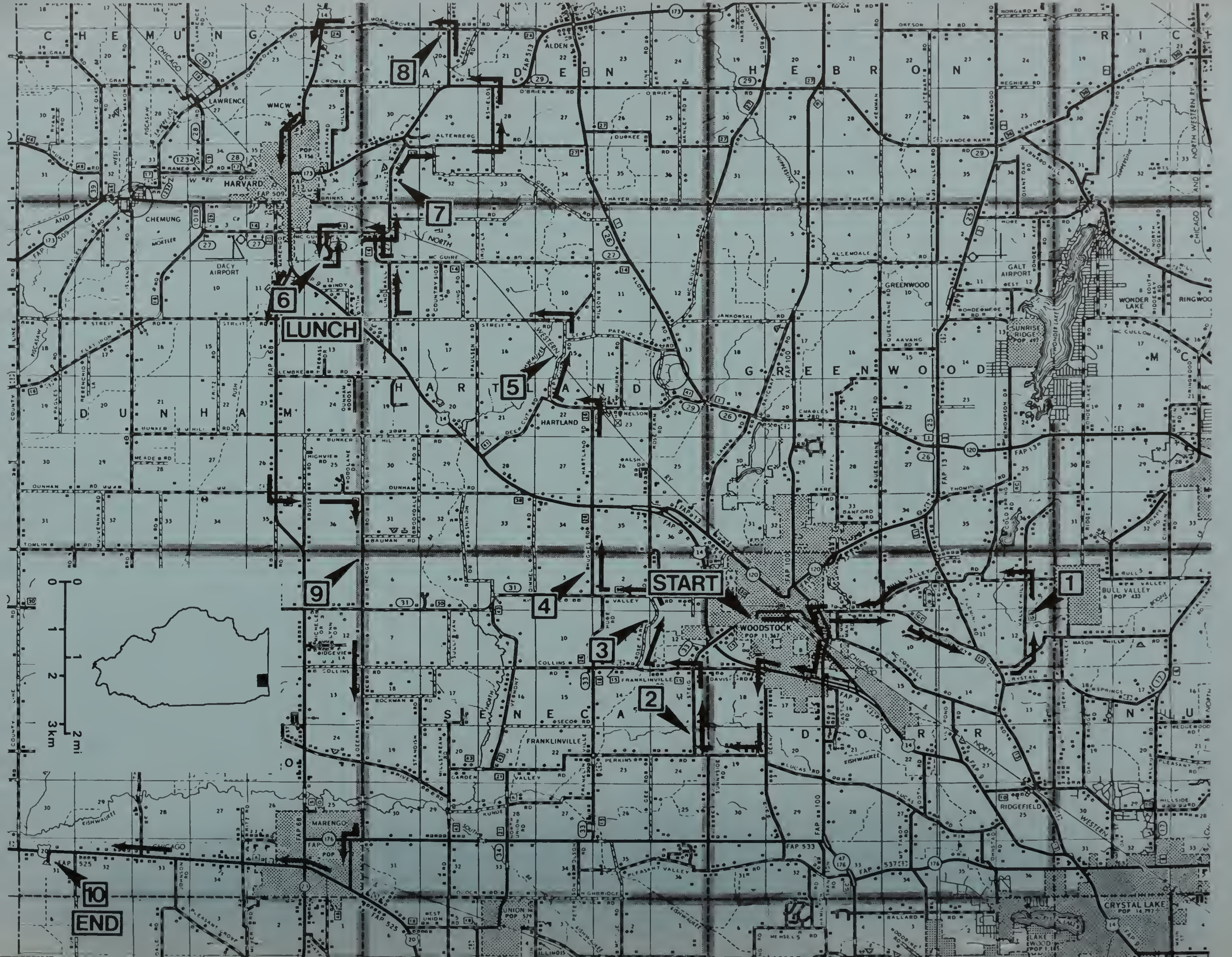
The blanket of loess deposited by the ancient dust storms forms the parent material of the rich, deep soils that today are basic to the state's agriculture. A soil made of loess crumbles easily and has great moisture-holding capacity. It also is free from rocks that might complicate cultivation. Those great dust storms that swirled over the land many thousands of years ago thus endowed Illinois with one of its greatest resources, its highly productive soil.

ORDOVICIAN FOSSILS



REPRESENTATIVE SILURIAN FOSSILS FROM NORTHWESTERN ILLINOIS


GEOLOGIC MAP
0 20 40 60 Miles
0 40 80 Kilometers
Pleistocene and Pliocene not shown
T TERTIARY
K CRETACEOUS
P3 PENNSYLVANIAN
Bond and Mattoon Formations
Includes narrow belts of older formations along La Salle Anticline
P2 PENNSYLVANIAN
Carbondale and Modesto Formations
P1 PENNSYLVANIAN
Caseyville, Abbott, and Spoon Formations
M MISSISSIPPIAN
Includes Devonian in Hardin County
D DEVONIAN
Includes Silurian in Douglas, Champaign, and western Rock Island Counties
S SILURIAN
Includes Ordovician and Devonian in Calhoun, Greene, and Jersey Counties
O ORDOVICIAN
CAMBRIAN
Des Plaines Disturbance - Ordovician to Pennsylvanian
Fault


START
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LUNCH
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END
WOODSTOCK
HARVARD
CHEMUNG
LAWRENCE
ALDEN
HARTLAND
GREENWOOD
WONDER LAKE
RINGWOOD
BULL VALLEY
RIDGEFIELD
CRYSTAL LAKE
MARENGO
UNION
FRANKLINVILLE
DACY AIRPORT
GALT AIRPORT
SUNRISE RIDGE
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